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Page

An Appeal to the Government 545
Copper 547
The Trade War 547
Trading in Italy, by O. E. Allo 548
Capturing German Trade: How to Ensure Success 549
Reviews 550
The Electrical Trades and the War 552
Legal 553
Our Legal Query Column 554
New Electrical Devices, Fittings and Plant (*illus.*) 555
War Items 555
Business Notes 557
Electricity Supply in Basingstoke (*illus.*) 559
The Aster Engine Works (*illus.*) 560
Automobile Searchlights for the French Army (*illus.*) ... 562
Notes 566
City Notes 568
Stocks and Shares 570
Exports and Imports of Electrical Goods during Sept., 1914... 571
Large Induction Motors: Some Features of Mechanical Design, by G. Moores (*illus.*) (*continued*) 572
Electric Brass Melting, by G. H. Clamer and C. Hering (*illus.*) 573
New Patents Applied For, 1914 576
Abstracts of Published Specifications 576
Contractors' Column ... ... Advertisement page xx

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AN APPEAL TO THE GOVERNMENT.

IT is satisfactory to find some of the more responsible daily papers devoting space to a reasonable discussion of the directions in which amendment is required if we are permanently to strengthen our trade and industrial position both at home and abroad. It is unquestionable that financial considerations will largely control policy. But the problem of finance is a many-sided one. As matters stand, inability to raise capital for extending works or taking up new lines will certainly be to some firms an insuperable barrier. In this respect agents for factory-letting in London report that many traders have intimated that they would like either to extend existing works or to secure larger ones, but they are at a loss to know where to find money for the equipment and raw stock in the absence of suitable security to place with bankers. One such agent advocates that the many committees now acting in connection with the trade extension movement should meet to consider whether a proposal could be put forward for the formation of a capitalised institution where borrowers of known position, trading ability, and ascertained assets (at present locked up in their businesses), could turn at the right time for help. The case for an industrial bank has once again been fully discussed in a series of articles and letters in one of the financial dailies. The subject has been done to death in times of peace during the past 10 or 15 years, and it is inevitable that under the present circumstances it should attract attention again. Maybe the different setting will lead to something more tangible being done. There have often been private parties willing to do something, but knowledge of the extent to which financial-industrial relations have been carried in Germany leads us to approve the preference of our contemporary for a movement strongly founded, widely based and substantially backed. We agree that

if a national bank of this character is to be established and is to receive the support of the Government, it must be taken in hand by persons of the highest standing in the financial and commercial worlds. No private scheme, however ingenious, would have the slightest chance of success without this backing, and the multiplication of such endeavours would tend to defeat the great end that must be kept in view.

It is stated that banks have lately continued to show reluctance to consider favourably loan propositions, and cases are advanced of new lines, such as colour printing, offering sufficient guarantees of success, which well-known firms have been forced to decline through being unable to borrow, on reasonable terms, the money needed for laying down the new machinery required. The bankers may have very good reasons for their action in presence of the exceptional circumstances of these times, but unfortunately the policy is the same as they found it desirable to follow in the piping times of peace. We were pleased to turn the other day from the consideration of this position to the generous offer which Lord Lytton has made to assist manufacturers in the promotion of industries for the production of articles hitherto imported from Germany. He offers free sites on his Knebworth estate, 25 miles from London, for workshops of an inoffensive character. The offer may perhaps be eyed askance by those who regard it as one of the sprat-to-catch-a-mackerel order, but the would-be manufacturer may be trusted to scrutinise the value of the offer for himself. While he does not ask for charity, he does need facilities for beginning new operations, and even the possession of a free site may be of some assistance in his efforts to secure financial support.

No doubt some of the proposals and offers that are being made are very interesting, and we have no wish to underrate their value or significance, but in a great measure they are only temporary expedients. We desire to put forward the view that what is absolutely necessary if we are going to deal with the present position in a thorough way is to investigate it authoritatively, and deal with it nationally along lines laid down as the outcome of well-considered Government policy.

While we have never advocated a Governmental policy in trade which might in the least degree obstruct the exercise in the freest and fullest possible manner of individual initiative and enterprise, we have at times seen fit to point out ways in which the Government, in our opinion, can legitimately assist British industry. Without trespassing on the field of political controversy, we may be permitted to say that we have a Government in power which is anxious to secure ample employment for British workmen. In its Trading with the Enemy measures it has been largely influenced by that consideration. In its Patents Act of 1907 also it applied legislation to the same end, and extended British manufacturing, whoever may have provided the capital. Immediately the war broke out it set its Board of Trade machinery to work with the determination of doing whatever lay within its power to assist British works to keep the wheels turning, and to capture the export trade of Germany and Austria-Hungary. Without saying anything as to the practical value of the information thus prepared—there are quite two views current—we may accept the active trade policy as indicating a willingness of the Cabinet to assist British manufacturing.

It may be that this struggle with Germany will leave its mark upon British national policy with respect to trade, and it may alter our Acts of Parliament concerning the incoming of aliens, the formation, registration, and conduct of private firms and limited companies, and many other matters bearing upon industry. It will be years after the war-guns are silenced before Parliaments have been able to reflect, in the form of amending enactments, all the effects of the war upon the mind of the British people. There are many things that will never be the same again. But the handling of matters of immediate urgency need not materially clash with the operation of these slower evolutionary forces. No doubt the Government's hands are well filled with matters of serious concern, and we do not propose that the electrical or any other industry should add to their embarrassment by re-urging all the many suggestions that we have made for the pursuance of a national trade reformation policy; some of those will probably come to fruition in the next few years. Yet we do feel the necessity for appealing to the Government to take the simple course of appointing at once a Commission to consider exhaustively the various important trade questions that have emerged since the outbreak of war. We make this appeal with the consciousness that in doing so we are representing what we may describe as a substantial manufacturing view; that compliance with the suggestion does not entangle the members of the Government in controversial questions such as it is desirable to avoid at present; and that it is entirely consistent with the trade campaign policy of the Government.

For what purposes do we suggest the setting up of this Royal Commission? Not, be it noted at once, for the purpose of adding to the untruth which Germans have set in circulation and fostered, that Britain has gone to war because of jealousy of German trade success. All opinion that counts to-day believes that if ever Britain had sacred justification for going to war we have it now. To suggest that the nation that rejected "Protection" would indulge in bloody battle for the sake of trade is stupid in the extreme, and we do not desire the nation to do anything that can fairly be interpreted in that way, but the war has shut this and other countries and our Colonies off from certain supplies of German manufacture, and has given rise to a strong and growing agitation for these to be made in England in future. As we stated last week, however, the matter is one of very great difficulty indeed, and mere agitation is not going to accomplish much.

It is most gratifying to hear from electrical manufacturers of the attention that they have been devoting to the wisdom or the possibility of their adding to the number and class of their products, but we fear that the position will not be sufficiently met unless their hands are strengthened by a statement of Government policy. So far the Government has had to limit its attention to new questions as they have arisen, but no doubt sooner or later a definite policy will be adopted which shall have for its object the ensuring of safeguards of some kind or other to assist British works to retain for a sufficient period after the war the new business which they now decide to take up. We hope it may be possible to develop and adopt such a policy along non-political lines and with the co-operation of all parties. To that end we recommend the appointment of a Royal Commission composed of manufacturers, scientific men of eminence, and Board of Trade representatives, who will make a complete investigation of the imports that we have been accepting from Germany and Austria in the past; will, with expert technical, commercial and industrial knowledge examine into the extent to which these can be produced in this country; and in cases where it is considered impracticable under prevailing conditions to manufacture them, will state the reason why, and if possible will suggest any measures which are essential in order that their profitable production may be assisted.

The Commission might have several sub-Committees dealing with different industries, these having power to confer together in case of necessity when questions of classification of particular lines arise. It seems not unlikely that some manufactures which are impossible of introduction by one class of industry alone, might become practicable by two distinct classes acting in co-operation. It is also conceivable—and this is an important point—that a success in a primary line of production would encourage many a subsidiary branch. A Commission constituted in some such way as we suggest would be capable of distinguishing between primary and secondary industries, would be able to say how far such factors as atmospheric conditions, technical training and skilled labour difficulties stood in the way; would be able to suggest whether or not it was wise, necessary or possible to avail ourselves of any specialised skill or knowledge possessed by Belgian or French refugees, and so on. Taking the fullest possible view of the situation and taking into account all these and other factors of a similar kind, we might be able to arrive at an unprejudiced and authoritative conclusion as to what new industries may be settled in this country with reasonable likelihood of success. Then the rest can be left to individual enterprise.

To our mind the department which is engaged in so elaborate a campaign urging the British trader to capture German trade, could quite consistently develop its proceedings along these lines. The individual trader would not need to stay his hand the while the larger investigation was proceeding; indeed, we should hope that he would be willing to place himself at the disposal of the Commission, as far as necessary, as it makes its inquiries.

In the course of such an investigation there would probably arise the question of the need for some basis of safety as an inducement for the manufacturer to undertake new production. It is conceivable that given some reasonable measure of certainty that demand for competitive lines would not fall away immediately foreign under-cutting and unscrupulous competition again became factors in our markets, many primary manufactures might be taken in hand.

How can this basis of safety be secured or assured? This, as it appears to us, is where the occasion would arise for the adoption of a national policy. With such a report as we have mentioned—drawn up by men of unquestioned repute in the scientific, manufacturing and industrial world, aided by men well versed in public affairs—at command, our legislative leaders would have a full insight into the whole matter, and would be enabled to arrive at conclusions making for the adoption of a national policy. They might possibly find it worth while to adopt some scheme or other under which all public money expended in the British Isles, and, with the co-operation of Colonial Governments, even in the Colonies and Dependencies too, might be employed, subject to suitable provisions, in purchasing British, instead of German, manufactures. Or in other

ways they might find it possible to devise means which would ensure, at any rate, a certain larger measure of support for British manufacturing than it has in the past enjoyed. In our belief, they would, in the present state of feeling, have the general consensus of opinion behind them in whatever they did to that end. The Commission could probably report within six months.

With such an assurance as a basis upon which to operate, there would undoubtedly be a greater disposition to proceed. It is noteworthy that some authorities hold that without some such measure as is outlined above, all the "capturing" of German trade that can be hoped for will be the temporary filling in of blanks which are now existing, due to the lack of German imports.

Between six and seven years ago, when the country was involved in the discussion of fiscal problems and their relation to industry, the then President of the Board of Trade, who is the present Chancellor of the Exchequer, made a proposition for a Conference at the Board of Trade between himself and the 12 best brains in British industry in search of what he described as a "substantial alternative." We reproduce from our issue of March 6th, 1908, the following summary of his speech :—

He had himself thought many a time that if he could get *hold of the dozen best brains in British industry, without any respect or regard to their political or fiscal opinions*, and if he could get them to come to the Board of Trade, say, and invite them to a room and say to them: "Will you please leave all your fiscal opinions outside on the doormat with your goloshes, and just apply yourselves to the problem of giving the best counsel to the Government as to the best methods, in your judgment, whereby a Government can help British trade and industry," in his opinion those 12 men—or rather 13—an unlucky number, but he was not superstitious, would issue from that room with a trade policy, a great creative, well-thought-out trade policy that would commend itself to nine-tenths of the people of this country.

This attitude, which commended itself to us as being the right one at that date, seems to be absolutely the correct frame of mind in which to approach the position that now presents itself. We do not forget that the First Lord of the Admiralty also once made a suggestion for a round-table conference with authorities interested to settle the electric supply problem of London. The members of the Cabinet certainly have no aversion to Conferences. And we believe that we may look with confidence to the present President of the Board of Trade (Mr. Runciman) to further his Department's trade war campaign by some such arrangement as Mr. Lloyd George suggested in 1908.

We, however, incline to the opinion that a Commission to deal with the whole subject exhaustively is required in addition to the conference of the 12 best brains; doubtless that would more or less naturally ensue as a result of the Conference.

To summarise, the Government is busy—very busy—and the time is unpropitious to burden it with many and troublesome details concerning the future of trade when we are still fighting for our national existence. But it can without much anxious thought refer the points we have mentioned to a Commission. It certainly could do no harm. It might, and we think it would, do a great deal of good.

Copper.

The tone of copper has been unsatisfactory in the extreme since last writing, and a decidedly downward movement has developed under realisations of pre-war contracts finding the market bare of buyers. The situation as regards the speculative department has developed weak spots, and has induced the Committee of the Exchange to make further regulations for the purpose of restricting trading. There is more than a suspicion that undue advantage has been taken in certain quarters of the permission accorded to deal, by using the facilities for the purpose of deliberately depressing the market. This is quite contrary to the spirit of the regulations, and the only way out of the *impasse*, therefore, was to prohibit all trading, both public and private, except in so far as it concerned the closing out of pre-war contracts. Refined copper has naturally not escaped from the disabilities imposed upon the market generally in this connection, and consumers have been able to buy at steadily receding prices. To-day £53 a ton is about the price of American electro, and business has been done at this figure. At round this price there cannot be much, if any, profit to producers, and it may soon become necessary to take a fresh view of the position. That production has been cut down at the mines by about 50 per cent. is past all question, and that this is a consideration which, in the fulness of time, must operate as a stiffening factor on prices is equally beyond dispute; the only query is when this is likely to come about.

So far the restriction at mines has not been reflected in refinery output, but the point is nearly reached when this will come into effect. It is estimated that production and consumption are about evenly balanced on the present basis of reduced output, but if it should prove that the already very drastic steps taken are insufficient to cause prices to hold up at near the present very moderate level, then the policy of restriction will undoubtedly be carried to a further extent yet. Producers and mine-owners have no intention of depleting their mineral resources at such prices as these, and although the process may take some little time, it may be implicitly relied upon that copper will not be produced (in America at all events) unless at a reasonable price to the sellers. So far as the European position is concerned it has undergone some little alteration lately owing to the attitude of Holland in the matter of the supply of copper to Germany. As soon as the war broke out Holland was put up by Germany as the intermediary for the purchase of material for war and other purposes, and in pursuance of this enormous quantities of American copper were shipped from the United States to Rotterdam. It was palpable that Holland could not consume these tonnages or anything approaching them, and our authorities then stopped Dutch steamers and exercised their rights of search, eventually declaring copper to be conditional contraband. The Dutch Government then ordered that all copper shipped to Holland should be consigned to it, and the next step taken was to forbid the exportation of copper from Holland. Germany is now frantically trying to buy copper in Scandinavia, and London merchants are bombarded with cables and letters from previously unknown firms, asking for offers of copper, spelter, and all other metals likely to be of use to Germany, but fore-warned being fore-armed it is improbable that any business has been done. Some American copper producers are, however, very keen to do business with Germany, and are charging about £10 a ton over the market price for metal sold in this way to our enemies. The next step may probably be that the Scandinavian countries, or some of them, will prohibit exports of copper, and in this way will the cord be drawn round the throats of the devastators of the 20th century, whose deeds would defile the records of a race of savages.

The Trade War.

Eleven weeks have now elapsed since the commencement of the great war—weeks charged with excitement and interest in all phases of our national life, and not least in that particular sphere with which this journal is associated. We anxiously scan the pages of our morning, evening and half-time papers in search of the latest news from the front, and have become accustomed to absorb with a thrill of emotion the glad tidings that the Allies have pressed the enemy back on the west, that the position in the Vosges is unchanged, and that there is no news from the centre, while in the eastern arena the Germans have smashed the Russians (Berlin wireless) and the Russians have smashed the Austrians (*viâ* Rome). The daily report of heavy firing in the North Sea whets our appetite for German submarines, and the nightly display of electric rays shot skywards reminds us that overhead transmission is no longer confined to electric power and telegraph lines. But little information can be gathered from the columns of our veracious lay contemporaries regarding the progress of the other war with which the electrical trade is more directly concerned, and therefore we have taken steps to obtain from the leaders of our industrial armies an expression of their views with respect to the progress of the campaign against our Continental competitors.

From the replies which have already come to hand, some of which are dealt with on another page of this issue, we have come to the conclusion that the course of events in this region bears a decided resemblance to that which we have observed upon the Continental field of battle; no sensational and decisive victories have been scored, but steady progress is being made in various directions, the pressure is being maintained and intensified, and full confidence reigns in the breasts of our industrial forces. The initial reverses—the financial stringency and the scarcity of raw material experienced in August, the disorganisation due to the withdrawal of so many skilled engineers and workmen from their normal occupations, and the temporary interference with our freedom of transport for goods and materials by land and sea—have all been practically recovered from; there is no lack of employment, orders are coming in freely, and the vacancies in technical staffs are being gradually filled. New lines of manufacture are being taken up, and additional plant is being installed—not with headlong haste, which would be unwise, but as circumstances permit. An especially gratifying feature of the situation is the unanimous statement that the financial conditions now prevailing are such as to offer no hindrance to the maintenance of a large volume of trade; some manufacturers in the early days feared that delays in payment for goods delivered would tie their hands, but happily this has not occurred. It will be noted that the new business recorded is largely derived from home and Colonial buyers who formerly obtained their supplies from the Continent; this is only what might be expected. Too little time has passed for the effect of the new conditions to be realised to any great extent in foreign countries; our Allies' hands are fully occupied with military measures, and neutral countries cannot instantly develop close relations with new sources of supply. But the indications in this respect are distinctly favourable, and one of our most weighty correspondents explicitly adopts a highly optimistic tone.

Amongst the wares which are now receiving greater attention in this country may be mentioned ebonite, carbons, porcelain insulators and accessories, magnetos, cheaper wires and cables, small portable apparatus, incandescent lamps, small motors, batteries for pocket lamps, enamelled ironware, permanent magnets, &c., and we hope the list will extend indefinitely.

Few of our readers can be aware of the enormous variety of goods that enter this country from Germany, and are sold by British dealers who, possessing works for the manufacture of certain items, are supposed to make also the goods which they in fact import. Attention has been drawn to this in many cases by the sudden interruption of supplies from the Continent. Even where the goods are largely manufactured in this country, there are many instances in which the "raw material" is partly manufactured abroad, and perhaps the distinction between "raw" and "manufactured" material in the minds of some is rather hazy. A very significant passage in one letter shows that it has been found possible to manufacture some articles at prices comparable with those of the previously imported goods; we trust that the experiment will be tried in many other lines.

On the whole, we feel that the cheerful tone of our articles on the subject of the trade war has been amply justified by the reports which we have received from numerous sources. The contest is still only in its early stages, and German competition is not yet extinct, for goods are being exported through neutral countries, in appreciable quantities; moreover, it appears that some agents for German manufactures laid in remarkably large stocks last summer, with singular foresight or presentiment. We cannot expect, nor would it be salutary, to leap ahead—steady progress is sufficient. And after the war? We must not think that we shall retain the new business without a struggle; "he shall keep who can." While we are winning the territory let us not fail to fortify and entrench our frontier at each stage, so that our position shall be secure and impregnable to the assaults that will be made later. Some useful and timely words of caution in this regard, and of advice as to the methods that must be adopted to carry on the war with success, are given in a communicated article elsewhere in this issue.

TRADING IN ITALY.

By O. E. ALLO.

Seven years ago I was sent to Italy by an English firm, who were represented by a local agent, with a view to extending their business in A.C. meters and introducing their D.C. meters and switchboard instruments. On my initial tour I carried about with me a perfectly sound and working sample, and although I was working under the disadvantages of not knowing the language at the time (I interviewed my customers speaking French), and not having any Italian catalogues or price-lists, I came home with some 200 meters ordered as samples, as well as with orders from existing customers. This is mentioned merely for the purpose of showing how willing "chiefs" are to see and try new articles. With regard to price, we were the highest at that time, but now this firm can compete with any of the better makes of meter, and still have the reputation of supplying the best instrument of its kind on the Italian market.

The electric lighting stations in Italy might be divided into three classes:—

1. Those owned, or partly owned, by German manufacturers: Genoa, A.E.G.; Florence, Bari, Brescia, Palermo, Siemens-Schuckert, &c.

2. Municipalities and private companies, either Italian or foreign (not German).

3. Electric lighting stations in small towns and villages.

In the first instance, practically all plant and material are ordered from the interested German concerns. They generally have someone of their choosing who attends to this.

In the second instance, open competition prevails, but so far all the work seems to have been done by German and American firms.

In the third instance, the electric lighting station is generally a small transforming station, where current, which is bought in bulk at high pressure, is transformed to distributing voltage. Companies (Italian) who have the concessions for the supply of a number of these small towns and villages, have their headquarters in some large centre and buy in the most favourable market.

It may be of interest to mention here that in these small towns and villages energy is charged for by contract. A current limiter is installed instead of a meter, and is adjusted to allow the number of lights contracted for to be burnt; if one lamp above this number be put on the lot will go out until the excess lamp has been extinguished, when the others again light up.

The charge made is generally 5 lire per month per lamp; the price of the current limiter is from 7 lire.

For lighting, heating and cooking, I have seen contracts made at from 15 to 30 lire per month, with current available day and night.

This lends itself admirably to the use of heating and cooking apparatus, as well as of electrical signs.

With regard to the exaggerated fears respecting long credit, I have, while in Italy, accepted orders for large machinery at the following terms:—

One-third of the amount to be paid at the time of ordering.

One-third to be paid on receipt of goods.

One-third to be paid after three months of satisfactory working of the machinery.

Surely this is not out of the way, and would be acceptable by most British firms. In the event of any firm cancelling the order after the payment of the first one-third, it is at the option of the contractor to keep the whole or part of this payment. This I had occasion to do once; the amount came to some £60. Payments for smaller articles, stores, &c., are generally made by the larger concern a month after the receipt of the goods, and others three months after receipt.

I should say that a good field should exist now for arc lamp carbons, large motors and generators, switchboards and parts, boilers, feed pumps, water pumping plant, registering instruments, general stores, copper and galvanised wires, conduits, &c.

CAPTURING GERMAN TRADE: HOW TO ENSURE SUCCESS.

(Communicated.)

In many influential quarters, including Governmental, the facile and glib advice has been tendered of late to the British manufacturer and exporter to seize the present opportunity of Germany's preoccupation to secure that country's foreign trade, without, however, vouchsafing regard to the means whereby that country secured her important position in the world's markets, or to the probability that those means, which aided her in obtaining, may eventually contribute to her regaining and retaining, that trade. Obviously, however, it would be futile for English manufacturers at the present juncture to bestir themselves to compete with Germans in oversea markets when most of the conditions which gave the latter their pre-eminence before the war will survive, as they certainly will in the main, after the conclusion of hostilities, and again give them the lead in the race. Wasted expenditure would be the sole return for the efforts put forth.

Two great factors have aided German trade in the past, and one of these presumably will remain unaffected by the war, while the other, although seriously affected, will only be temporarily impaired. The former factor is the far-seeing policy which the paternal and bureaucratic Imperial Government has pursued towards German trade and industries, as a whole and individually. Where the British Government has left the development of British trade almost wholly to private initiative, the German Government has made it a study how to "engineer" trades and industries, recognising them as the life and essence of the body politic. Hence it has made it its business to foster the nation's home industries in multifarious ways, and to seek outlets for their products by every means—fiscal, pecuniary, advisory, and other. It is true assistance of a like kind is also furnished by our Government, but its effective value is incomparably inferior to that enjoyed by our trade rivals. The German Government's efforts will undoubtedly undergo no intermission after this war, even though difficulty may be experienced, in an altered financial situation, in covering the votes for steamship subsidies and other transit facilities.

The second great factor which has served to aid German trade is the lavish capitalisation of industry which is a part of the German banking system. More than anything else, perhaps, this has been the means of the expansion of German industries and oversea trade. Whereas capital in England is only with difficulty drawn to industrial ventures, the contrary has been the case in Germany. With the financial collapse that must attend and follow the war, this lever of trade welfare must be seriously impaired. Recovery will, however, sooner or later set in, and this lever will then enter again into operation in favour of German trade. But the interregnum before recovery will certainly be the opportunity for our manufacturers, but only in the event, and to the extent, of their pondering over the lessons of the past and devising means for modifying or counteracting these and other conditions under which we have seen our former world-wide trade supremacy whittled away to its present dimensions. Failing this, exporters' efforts will simply land this country's trade in exactly the same position as it was previous to the war.

Of the many factors which have helped to give German goods prominence in oversea markets may be mentioned (1) price, and (2) business method. Contrary to the vulgar view, quality plays only a small rôle in the success of German foreign trade. For the fact that the German manufacturers can undersell the British in most of the oversea markets, the latter is only for a small part responsible. The German achieves his cheapness first by cheap labour, provided by the longer hours worked by German workmen, combined with relatively lower wages than the English standard. The scale of wages and hours set by British trade unions debars the English manufacturer of any like means of cheapening the cost of his products. He is equally debarred, by the indifference of his own Government, from a second assistant towards cheapness furnished by the German Government in the shape of cheap railway rates for goods destined for exportation and cheap import rates for raw materials. To these is also to be added: cheap ocean freights by means of steamship subsidies. The pockets of English manufacturers would need to be of the depth of those of a Crœsus to struggle against these accumulated factors, more especially in view of the attitude adopted by our railways with regard to railway rates.

Too much attention cannot be concentrated on the bearings and working of these cunningly devised Government and private railway and steamboat subsidies. The subsidies granted by the German Government to German shipping lines, allowing German manufacturers to export their goods to British, Colonial, and foreign markets at a cost such as to equal in many cases the saving of the whole of the sea freight, is a lever which enables the German to monopolise markets even where, as in our Colonies, English goods enjoy the advantage of a preferential tariff. In some cases these subsidies have, furthermore, been the means of enabling them to wholly oust British trade from British Colonies and neutral markets. Witness British East and Central Africa, and also the Portuguese Mozambique Coast. Should our Government persist in its refusal to grant subsidies to shipping companies for maintaining a service on half-paying trade routes, the whole of these regions will fall to the Germans after the war, as before, whatever our manufacturers may do to prevent it.

The German levers of business method which have proved in practice superior to our own are, first, those which proceed from the Government, and, secondly, those due to private initiative. Examples of the former are the institution and sending abroad —and notably to China in a prominent instance—of permanent travelling exhibitions of German goods in particular branches, in most comprehensive detail, accompanied by estimates, catalogues, and prices, in the tongue of the natives. The commissions of experts sent on other occasions to study and report on the trade of particular countries, is a second example. Private initiative in such lands as Spain, Italy, Roumania, and Turkey is more particularly illustrated by the founding of banks and branch houses in leading foreign cities, the acquisition and development by them of mines, waterfalls and other undertakings, the working of concessions for the establishment and control of electric light and power services, the founding of industries using electric power, etc., whereby is earned for the industries of the Vaterland the reward of the control of the orders for the machinery and material which are eventually required, and the local employment of German capital and labour. Our own Colonies in South Africa furnish a striking example of this co-operation of trade and capital, first in the employment of German capital in mine development, and secondly in the permanent appropriation of all subsequent orders for mining, electric and other machinery equipment. The foregoing are illustrations of the operations of the great capitalist, industrial, and commercial trusts which mark modern German development, to which is to be added the foundation of innumerable commercial agencies, branch houses and repair shops, in cities abroad, to facilitate the sale and use of German machinery. More individual method is illustrated by the up-to-date procedure of German travellers and representatives, their detailed

estimates, catalogues and quotations in native tongues, their delivery of goods to the purchaser's door, their solicitude for the tastes and whims of their clients—contrasted with the "take it or leave it" British attitude—their preparation, packing, labelling and dispatch of goods, and, not the least, their utilisation of the local press to glorify German goods, industries, or firms, and at the same time depreciate those of this country by the ostentatious record of orders secured here. Many of these methods are new to the procedure of our exporters, and perhaps repugnant to them, but their value has been proved by the trade success effected by their means.

From what has been set out in the foregoing it will be seen that, for our manufacturers to draw profit from the present opportunity, they must overhaul and revise all their previous methods of trade pursuit, and also probe *à fond* the *modus operandi* which has given our competitors their tangible advance in the race for the trade of the world, and show a readiness to learn even from the despised German. They will also have to gauge the full bearings of the German Government's past commercial policy, with a view to finding a fitting equivalent or counterpoise through either a reformation of the constitution of the Board of Trade or the creation of a new live Ministry of Trade. Reduced scales of railway rates and charges will, by some means or other, have to be brought about; and steamship subsidies or equivalents will have to be provided by the Government to match the aids enjoyed by the German manufacturer. Lengthening of the hours of labour and lowering of the scale of wages would appear to be beyond the possibility of achieving, and so much of prejudice to our industries will have to be submitted to. More capital will have to be invested in industrial undertakings than hitherto, and some steps to this end have already been taken with the banks. The intimate co-operation of capital and industries, as in Germany, is perhaps impossible of realisation: but the investment of capital in enterprises abroad is no new thing to us, as witness the municipal water and gas installations, railways, and industrial undertakings which, in the past, have been set up in numerous Continental cities, by the union of British capital and industries. Co-operation in the export trade must, too, be introduced, and instead of the present wasteful competitive efforts of innumerable individual firms in relatively small markets, spheres of action to a limited number must be allotted, the energies of the others being diverted to more favourable and less worked outlets elsewhere. The individual agency for securing trade will have also to be better selected, and hitherto methods of approach to and treatment of customers modified. On the part of the manufacturers, more readiness to lay themselves out for new lines will check the frequent loss of much valuable business.

These are the minimum of essentials of a successful trade warfare with our powerful rivals, and when they are realised, and not till then, will British trade be able to count with confidence on success in, and profit from, the present opportunity.

Nigeria.—According to the *Colonial Journal*, a report has recently been made by Mr. S. M. Ele for Messrs. Preece, Cardew and Snell on the supply of electricity for Port Harcourt. A steam plant is proposed on the Bonny River, with a three-wire D.C. network. The installation would cost £26,000; local coal costs 30s. per ton delivered, and it is proposed to charge 10d. per unit for electricity. For Kaduna also a scheme has been prepared to furnish light and power to the railway, waterworks and ice plant, and for town lighting, &c. An initial output of 1,285,000 units, of which the railway will take 985,000 units, is anticipated. A D.C. 440-volt system will be used for the railway shops and a 2,200-volt three-phase system for distant supply. The cost of the scheme is given as £65,000.

REVIEWS.

Picture Play Photography. By H. M. Lomas. London: Ganes, Ltd. Price 5s.

While the subject of this book is not in itself of electrical interest, it is so intimately associated with electric lighting that it may fairly claim a reference in our pages. The book is well written by a specialist in photographic art, who shows that he understands clearly the science of illumination as applied to his ends, and, moreover, is able to impart his knowledge to others. The use of the enclosed arc lamp for illuminating scenes that are to be biographed is strongly advocated, in preference to open or flame arcs; about 20 such lamps are required for an average scene, taking 15 amperes at 240 volts each. Mercury vapour lamps are also suitable.

In this connection we find ourselves in conflict with the author, who, after justly satirising a so-called "skilled engineer" who had never heard of a cathode, takes us to task for stating that "no ultra-violet rays could pass through glass," and goes on to suggest that "for purely commercial reasons certain people who ought to know better make inaccurate statements, and do not trouble either to test them or to look up reliable information on the matter." But he is speaking of the actinic rays of which he makes use in photography, while we, as our article clearly showed, were referring to the rays which injure the eyes and burn the skin—the ultra-violet rays of short wave-length, which are of no use to the photographer because, we repeat, they cannot pass through glass, and which are not present in sunlight because they cannot penetrate the earth's atmosphere to any great distance. Needless to say, we carefully verified our facts before we made the statements criticised by Mr. Lomas, and we may quote here Dr. C. P. Steinmetz, one of the greatest living authorities on electrical science:—"These very short ultra-violet rays are extremely destructive to the eye: exposure even to a moderate intensity of them for a very few minutes produces a severe and painful inflammation, the after-effects of which last for years." Has Mr. Lomas ever heard of these rays? Dr. Steinmetz goes on to say that "even a very thin sheet of glass is opaque for these radiations." "Clear transparent glass thus offers a practically complete protection against the harmful effects of ultra-violet light, except when the latter is of excessive intensity, and thus arcs enclosed by glass globes are harmless." The matter is very fully discussed in his work on "Radiation, Light and Illumination," pp. 52—62. Prof. S. P. Thompson, whose authority is also unquestioned, states that "Even the lightest crown glass, though moderately transparent to waves from 15 millionths to 11 millionths of an inch long, is totally opaque to all waves smaller than 11 millionths." Now, the injurious rays have a wave-length in the neighbourhood of 8 millionths of an inch—an octave above the point of maximum chemical activity. These are not the only authorities that we consulted at the time, before we made the remarks to which Mr. Lomas has taken exception, and we may also refer to the important note on "Ultra-violet Rays" in our issue of Oct. 9th. He does not mention us by name, and this is fortunate, in view of the injustice of his insinuations.

Full instructions for the arrangement of the electric lighting of the living pictures are given in the book, in minute detail and with abundant illustrations; the differences between natural and artificial illumination are clearly brought out, and the reader is warned against the production of unnatural effects. The technique of the photographic processes is no less fully treated of, and while we are not competent to criticise this portion of the book, it gives us the impression that the author is a master of his craft, and an able teacher.

Electric Light Accounts and Their Significance. By H. M. Edwards, Auditor to The New York Edison Co. London: Hill Publishing Co. Price 8s. 4d. net.

The author in his preface states that in his preparation of the work he has undoubtedly been influenced by his connection for many years with one of the largest electricity supply companies, and also by his work with the accounting committee of the National Electric Light Association, though the system of accounting advocated is not in all its details the one followed by the New York Edison Co., and it differs in some respects from the system adopted by the National Electric Light Association. However, these differences are not material, and the book's chief claim to the reader's interest, he believes, lies in the explanations that accompany the accounts.

The matter contained in the book and the manner in which it is presented are good, though naturally the terminology and technicality employed are American, and more or less inapplicable here, while the ground traversed by the writer has been, it may be incidentally stated, covered (in regard to British practice) in various forms on different occasions in the columns of the *Review*. The diction or style is that of condensed and terse expression, and the author tells his story, if we may so term it and which may be read with advantage, of "Electric Light Accounts" interestingly.

The treatment of the subject resolves itself into three parts:—

I. Balance Sheet.—Description of balance sheet, plant investment, assets, suspense accounts, liabilities, reserves, capital, stock.

II. Income Accounts.—Definition of income, gross earnings from operations, operating expenses accounts.

III. Miscellaneous.—Account symbols, work order system, customers' accounts and records, accounting for surplus renewal and contingency reserves, the income statement and what it should contain, analysis of balance sheet.

In the chapter on customers' accounts and records the author states that there are two systems of handling customers' accounts in general use. In one of these all the facts are embodied in the ledger, and in the other the facts are divided between a billing medium and the ledger. The system first referred to follows long-established gas practice, and the second is the outgrowth of conditions peculiar to the electric light business.

As regards the gas ledger, one account can be kept for each meter set, and although the customer may have several meters it is usual to render a separate bill for each one. The entry in the gas ledger need show simply the date and the state of the meter, the indicated consumption and the extension thereof at the given rate. The accounts are entered therein in geographical order and usually maintain that order.

Electric current is sold at differential rates. A customer may have more than one form of contract on the same premises, and several meters may be furnished him under each contract, the charge being based on the sum of the meter readings so furnished. The data entering into the calculation is varied in character, especially if a maximum demand charge is involved or if the rate is based upon a guaranteed amount of consumption. There are many variations of all the factors in use, the result being that electric light calculations are complex in their nature and require considerable room for the spreading out of the details making up the charges. The business is continually increasing, and it is not an unusual occurrence for whole block of buildings to be connected to the mains at one time. If, therefore, it is desired to enter the accounts in geographical order some kind of flexible binder must be provided to permit new accounts being inserted in their proper place. In these conditions the billing medium has been devised in which the details of the individual charges are spread out and the amounts then posted to the debt of the customer in a separate record. Such a billing system usually consists of loose sheets with the name of the customer printed on the left-hand side of the sheet, the names appearing on succeeding lines in geographical order. In vertical columns across the sheet appear details of the meter readings and the consumption rate, and extension and additional columns are frequently provided for distribution purposes. Such sheets when bound constitute a record which fulfils all requirements.

The Year Book of Wireless Telegraphy and Telephony, 1914. London: Marconi Press, Ltd. Price 2s. 6d. net.

The most frequent comment on the first edition of this Year Book was that it was too good value for its price, yet nearly two hundred pages of text have been added to the present edition while the price remains the same. The chronological record of development in wireless telegraphy has been extended back to 1881, the date of Michael Faraday's discovery of electromagnetic induction; for the years subsequent to 1896, however, the record presented is little more than that of development of the Marconi system and interests. Predominant though these be, it is surely desirable to include in such a record the tale of achievement by other systems. Indeed, the whole book is still essentially a Marconi Year Book, and though this does not detract from the value of the great mass of information presented concerning laws and regulations, call letters and station lists and general technical matters, it is desirable to intimate in its title the, in some cases limited, scope of the book. Little information is presented concerning the progress and prospects of the Imperial wireless chain. A useful report of the articles and regulations of the International Convention on Safety of Life at Sea (London, 1914) has been included, and the existing sections on the Radiotelegraphic Convention, laws and regulations and wireless telegraph stations of the world have been retained and brought up to date where necessary. In the tables of land and ship stations, the system employed should surely be indicated, and other technical details such as the plant kilowatts installed would greatly increase the value of the work to technical readers. The alphabetical list of call letters for land and ship stations is a valuable feature.

The special articles on various wireless topics have all been written for this edition and maintain the high standard set in last year's volume. Prof. J. A. Fleming writes on Wave and Wave Motions; Dr. Erskine Murray on the Function of the Atmosphere in Transmission; Prof. E. W. Marchant on the Measurement of Strength of Wireless Signals; C. E. Prince on Problems of Telephony; G. E. Turnbull on Wireless in the Merchant Service; R. G. K. Lempfert on the Application of Wireless to Meteorology; and A. R. Hinks on Wireless Time Signals and Longtitudes. It is doubtful whether these articles will be intelligible and readable to the layman; to the expert they will be interesting though presenting nothing new; but to the student and amateur wireless worker they should prove very useful.

The chapters on international time and weather signals and on the work of the B.A. Radio-telegraphic Committee are of universal interest, and, in particular, to those who have installed time signal receiving sets or who are in a position to render amateur (but by no means trivial) assistance to the B.A. Committee by making systematic records of strays and X's. The valuable collection of formulæ and equations, tables, glossary of terms, code signals and so on are retained, and the lists of

patent applications and wireless telegraph companies, biographical and obituary notices and the classified bibliography of wireless telegraphy and telephony have been brought up to date. An international directory of amateur wireless societies is included, and thirty-two personal photographs and plates illustrating land and ship stations and equipment are presented, these being different from those in the first edition. The wireless map of the world is but one of the many features, any one of which may easily be worth far more to the reader than the cost of the whole volume. Is it not possible, however, to show on the map lighthouse, lightship and naval stations not open to public correspondence but available for use in emergency; also to show at least the more important ones of the many private experimental stations now in operation? Such a map would be invaluable to all wireless workers whether amateur or professional. The general character of the Year Book remaining as before, its size being so substantially increased, and so much fresh and excellent material being added, the volume is even better value than was the first edition, but, for the same reasons, the criticisms levelled against the latter apply even with greater force to the second edition. Do or can the technical sections of the work appeal to the man in the street, and are they sufficiently terse and comprehensive to meet the requirements of the expert? The inclusion of wireless telephony in the title of the book is hardly justified by the information presented on this subject. The index is still rather short and not easy to find quickly.

THE ELECTRICAL TRADES AND THE WAR.

Our readers will remember that during the first week after the declaration of war between this country and Germany we addressed inquiries to a number of leading electrical manufacturers, in order to ascertain their views on trade prospects, and we summarised their replies in an article published in our issue of August 14th. Those replies were so generally optimistic and concordant, that eventually we cut short our investigations, feeling that to make further inquiries was superfluous. We have not lost sight, however, of the obvious fact that ideas formed at so early a stage must be very largely speculative in character and based on abstract, not concrete, foundations. We have therefore renewed our inquiries, in the hope that the period of two months which has elapsed may have enabled manufacturers to form more definite opinions as to the probable effect of the war on the course of trade; and in order to crystallise ideas to some extent we have invited a large number of electrical manufacturers to favour us with their views on the following points, together with any others that may appear to them worthy of comment:—

1. Have you sufficient orders in hand to keep your works fully employed?
2. Have you any difficulty in obtaining an adequate supply of labour?
3. Are new orders coming in at a satisfactory rate?
4. Is new business coming in which formerly went to Continental firms, from neutral countries, our Allies, and the British Empire?
5. Is the supply of raw materials sufficient for your requirements?
6. Are the financial conditions prevailing such as to enable you to accept orders freely?
7. Are you starting new lines of manufacture formerly dealt with only by Continental firms?

A number of replies have already come to hand, a first instalment of which is dealt with below. Further extracts from letters will be published in our next issue, and if any of our readers who have not been directly approached—for our list was by no means exhaustive—feel disposed to add their comments, we shall be glad to receive them. Our thanks are due to our correspondents for their prompt response to our invitation.

A Large Manufacturing Firm.

1. At present our works are fully employed—in some directions we are working overtime.
2. We have a difficulty in obtaining an adequate supply of skilled labour. Of course, the number of men who have left us to join the Colours has been a handicap, and we have not yet been able fully to overcome it.
3. The volume of our orders is, as a whole, satisfactory, and it is interesting to note that from August 1st to date, the volume is greater than for the corresponding period of 1913; but we have not so many contracts for heavy apparatus, which indicates that our small orders (*i.e.*, those under £5,000 each) are considerably in excess of the corresponding period a year ago.
4. There has been no substantial amount of new business coming to us which formerly went to Continental firms; our business has been (from the standpoint of its source) substantially normal. We have a few orders which would probably have been taken by Continental firms.
5. The supply of raw materials is sufficient for our requirements.
6. Financial conditions have been very good, *i.e.*, our collections have been excellent, and practically no one dealing with us has taken advantage of the moratorium. It is obvious that under present conditions, however, there will be some difficulty in financing new enterprises on a large scale, but I am optimistic enough to believe that this will not be a serious handicap (witness the recent issue of the South-Western Railway as evidence of what I mean). A lot of very small people owing us money have come to grief, but the aggregate is trifling, so much so as to be almost negligible.
7. We are not starting new lines of manufacture formerly dealt with only by Continental firms; our line has been very extensive, and practically covered the entire field. We are, of course, making every effort to push our business in the foreign field, but we have always done this in the past, though, of course, the present conditions have removed, for the time being at least, some of our most serious competitors.

Another Large Firm.

1. We have sufficient orders in hand to keep our works fully employed for some months to come.
2. We have no difficulty in obtaining an adequate supply of labour.
3. New orders are coming in at quite a satisfactory rate, and, so far, have not been below the average for previous months in this year.
4. We are getting a considerable amount of business which formerly went to Continental firms, the destination being chiefly the United Kingdom and the Colonies. Many of the orders we have obtained are orders which were in process of manufacture in Germany before the war broke out, which have been cancelled, and our machines ordered to replace them.
5. The supply of raw material is generally sufficient for our requirements, but we are finding a little inconvenience in some material, of which we do not use a great amount; but the Board of Trade Commercial Intelligence Department have arranged with various people to manufacture these parts, and the B.E.A.M.A. have also taken the matter up with their members.
6. The financial conditions prevailing at present are such as to enable us to accept orders freely, but if we are going to take German trade later, the financial facilities which are at present available in this country will have to be considerably extended, in order to meet the long credit which has to be given in the Colonies and foreign countries.
7. We are starting one or two lines of manufacture which were formerly dealt with by Continental firms, but we are not at liberty at the moment to reveal these.

With regard to general remarks on this subject, we would point out that a great deal of the business which we have done is the provision of motors for driving machine tools and other machines for ammunition machinery, and various armament work. If this demand falls off, the dynamo and motor business will probably also fall off very considerably, as the demand for motors in ordinary industries, especially in the textile trade, has completely fallen off.

Messrs. Gent & Co., Ltd.

We are very glad to have the opportunity of answering the questions which you put to us.

1. We have sufficient orders in hand at the present moment to keep our works fully occupied. In fact, part of our works are working overtime.
2. With regard to the difficulty in obtaining an adequate supply of labour, we have had several vacancies in our works owing to members of our staff having enlisted, and some of these it has been rather difficult to fill. We are, however, doing our best in this direction.

3 and 4. New orders are coming in fairly well, but still there is room for plenty more. We are pleased to say there is a good deal of business coming to us which formerly went to Continental firms, but it is more from the home trade than from abroad. Personally, we are inclined to think it is a little too early to expect orders from Overseas Dominions, but, we may say, we have plenty of inquiries for new business from allied countries.

5. The supply of raw material is a little restricted, but we are not suffering a great deal from this respect.
6. Financial conditions prevailing are, fortunately, such as to enable us to accept orders freely.
7. We are pleased to say that we are starting several new lines of manufacture formerly dealt with by Continental firms, but these

are no great departure from our own business, but merely an extension of it.

To sum up the whole matter, we are, if anything, profiting by the war in that a large number of orders which, under ordinary circumstances, would have gone to Continental firms, or, at any rate, which have Continental control, are coming to us, and we expect that we shall shortly have to extend our premises in order to deal with the increased business.

MESSRS. WARD & GOLDSTONE.

1. Since the war began there has been a very considerable demand for our manufactures, particularly in wires, cables, &c., which, in the past, have been so extensively purchased from the Continent.

We are increasing our plant and filling up every corner of our works with new machinery in order to cope with the demand, which is not only for the home trade, but more particularly the export trade.

2. With regard to your question as to difficulty in obtaining labour, we find this is quite normal.

3 and 4.—We have a large number of inquiries from neutral countries which formerly purchased from Germany and Austria, but the prices at which they have placed their orders in the past are such that it is only with reluctance that they pay the advanced prices demanded by us, though they appreciate that they are receiving better quality material.

5. We have no difficulty whatever in connection with the supply of raw materials, but there is great delay in connection with fine wire drawing, owing to the immense demand for Government purposes.

6. With regard to the financial conditions, we can only express our extreme gratitude to the trade generally for the way they have met their liabilities in spite of the moratorium. Generally speaking, we think that there were not 5 per cent. of our customers who took advantage of the moratorium, and those that did were generally firms who would take advantage of any opportunity to evade payments. We think the manner in which payment has been made is highly creditable to the nation and to our trade generally.

7. We are starting making many new lines which, in the past, were considered to be practically the monopoly of Continental firms, and we are associating ourselves with other manufacturers in order to obtain these lines.

For instance, such lines as porcelain cleats, reels, and insulators generally, have been imported in immense quantities from the Continent. We are now arranging to have these made in England, and already supplies are starting to come in.

Enamelled iron shades, which in the past have been almost entirely imported from abroad, are now being made for us in this country, at prices that compare not unfavourably with those of foreign make.

Such articles as electric massage vibrators, portable heating and cold-air-blowing apparatus, are now being made by us, and we find to our surprise that they can be made at prices that are practically as favourable as those at which the foreigners supplied us in the past.

In conclusion, there is one observation that we should like to make, and that is, that we are doubtful whether the efforts made by us and other manufacturers to wrest some of the foreign trade may be ultimately successful, as we find that such is the patriotism (!) of some firms, that even now they are obtaining their supplies of wires from German houses, who, remarkable to relate, particularly in one instance of which we are aware, appear to have laid in such an abnormally large stock, that they seem to be able to supply indefinitely such lines as cotton and silk-covered instrument wires, enamelled wires, dynamo wires, &c.

THE BRITISH ELECTRIC TRANSFORMER CO., LTD.

Questions 1-6 are answered on the same general lines as the foregoing. The company is not at present starting any new lines of manufacture.

MESSRS. T. HARDING CHURTON & CO., LTD.

Answers to questions 1-6 are equally satisfactory, but it is not possible immediately to replace the specially skilled labour of a large number of employés who have joined the Colours.

The company has not yet undertaken the manufacture of any fresh lines formerly dealt with principally by foreign firms, but it has some under consideration.

THE WALSALL ELECTRICAL CO., LTD.

We have lost 28 of our men, 26 of whom have volunteered for active service, and the other two were Reservists, and due to this reduction our works are fully employed, the diminution in orders being only slight. We have during the last few days been endeavouring to increase our hands, but there is a dearth of labour in this district; as a matter of fact, the Walsall Labour Exchange on Monday only had two boys on their books.

With regard to the rate of orders coming in, this is quite satisfactory, and we have during the last few weeks received inquiries from Russia, Norway, Sweden and France which we have not previously had. We are not experiencing any difficulty with raw materials, as we have been able to overcome the difficulties we had during the month of August. With regard to financial conditions, we are experiencing practically no difficulty in this direction.

We have commenced to manufacture one or two lines which were hitherto manufactured on the Continent, and trust we shall be successful in retaining this trade when hostilities cease.

(To be continued.)

LEGAL.

OSRAM LAMP WORKS, LTD., *v.* CORONA LAMP WORKS, LTD.

APPLICATION was made on behalf of the defendants in this action by Mr. Frost, on Friday, October 16th, to Mr. Justice Sargant, in the Chancery Division, for a postponement of the trial until after the expiration of the war.

COUNSEL said the ground for the application was the difficulty of getting expert evidence from Germany, and the fact that some of the witnesses required at the trial were serving with the British forces.

MR. JUSTICE SARGANT remarked that he could not assume that the Germans were the only persons competent to give expert evidence.

MR. WALTER, K.C., for the plaintiffs, opposed the application, and reminded his Lordship that under an order of the Court experiments had been conducted in the presence of experts on both sides. The evidence of these experts was available.

MR. FROST submitted that there could be no hurry for the trial as the defendants had discontinued the manufacture of the lamp complained of about two years ago. The writ in the action was issued so long ago as December, 1912, and the plaintiffs had been in no hurry to bring the action to trial.

MR. WALTER said he would not oppose a reasonable adjournment, so that defendants could put their evidence properly before the Court, but he reminded his Lordship that by agreement the evidence was to be limited to the process as demonstrated before the experts. He would not oppose an adjournment for a month.

His LORDSHIP thought the defendants should have longer than that. He would direct that the case should not come into the list for hearing before six weeks, and if the defendants found it impossible to be ready by that time they could make a further application. The order would be without prejudice to any further application that might be made.

HERBERT MORRIS, LTD., *v.* SAXELBY.

Question of Service Agreement.

ON Thursday, October 15th, was concluded, before Mr. Justice Sargant, in the Chancery Division, the hearing of this action brought by Herbert Morris, Ltd., of the Empress Works, Loughborough, and elsewhere, to restrain an alleged breach of covenants contained in a service agreement of April, 1911.

The plaintiffs' complaint was that, though carrying on a general engineering business, they specialised in such things as overhead electric runs, and the fact that the defendant had left their employ and entered that of Messrs. Vaughan, a trade rival, was calculated to do them serious injury.

The defence was that as regards the covenant not to disclose anything that had come to his knowledge as a servant of the plaintiffs, the defendant had not disclosed, nor did he propose to disclose, any confidential information, and as regards the clause prohibiting him for a period of seven years from entering into the employment of any firm in the United Kingdom which traded in the goods specialised in by the plaintiffs, it was too wide and not necessary for the plaintiffs' protection.

The case was argued by Mr. Walter, K.C., and Mr. Kerly, K.C., for the plaintiffs, and Mr. Mark Romer, K.C., and Mr. Sheldon for the defendant.

In opening the case, Mr. Walter said that the plaintiffs were a firm established about the year 1880, who, besides carrying on a very large general business, made a speciality of pulley blocks, electric overhead runs, and overhead tramways and cranes. For the purpose of carrying out this part of their business they had standardised certain things, after numerous experiments and trials, with the result that they could go to the trade with an advantage over competitors. Secrecy as to measurements and the like was of great importance to them. The defendant entered their employ as a young man straight from school, and was taught draughtsmanship. By 1906 he had become chief departmental draughtsman, and in 1908 he was sent to Cardiff as resident engineer. In February, 1909, he was transferred to London, and in 1910 to the plaintiffs at Loughborough, where he was given charge of the selling department of the special branch of the business in question. In 1911 he was asked to and did enter into an agreement, the restrictive covenants of which it was alleged he had infringed. The agreement was for two years certain, but terminable by four weeks' notice on either side. Shortly before April, 1913, when the two years would expire, the defendant gave notice to determine the agreement, and he left the plaintiffs on April 19th, 1913. He then went to a French firm who had done business with the plaintiffs, but returned to England in February, 1914, and entered the service of Vaughan & Sons, who were active competitors with the plaintiffs in the supply of the very things the plaintiffs had made their speciality.

In answer to a question from his Lordship, MR. ROMER said the defendant was not now with Messrs. Vaughan.

MR. WALTER said that the plaintiffs were in 1911 almost without competitors in the pulley blocks and other things that they had made their speciality, and that formed about three-quarters of their business. The defendant had acquired much information as to details of size, width, strength and the like of the various parts used by the plaintiffs, which information would be very valuable to competitors.

MR. MORRIS gave evidence in support of the plaintiffs' case, which was summed up by MR. KERLY, who submitted that in such

a case the prohibition was not too wide for the plaintiffs' protection.

Mr. Walter stated that they had not evidence of actual disclosure by the defendant.

Mr. Saxelby gave evidence for the defence, and said that before accepting an engagement with the French firm he tried to get employment with an English firm not dealing in the plaintiffs' specialities, but failed.

Mr. Arnold Goodwin, managing director of Arnold Goodwin and Sons, Ltd., spoke to having manufactured pulley blocks for the plaintiffs in the early nineties. There were, he said, a number of firms who manufactured them. There was no secret process of the patents in connection with their manufacture. They were quite common, though some firms might specialise in details. It was very unusual, and he thought very unfair, to have restrictive covenants in connection with this kind of business. His firm did not think it necessary for their protection.

Evidence was also given by Mr. Wharton, representative engineer of Vaughan & Sons, who said they started making pulley blocks as an invention of his. They were now competing with the plaintiffs in pulley blocks and overhead cranes.

In summing up the case for the defendants, Mr. Romer submitted that this was an attempt by the plaintiffs to obtain a monopoly of something for which they had no patent.

Mr. Walter was heard in reply, and at the conclusion of the arguments his Lordship reserved judgment.

Tramcar Accident Claim.

Judge Reginald Brown, at the Stockport County Court, recently heard an action in which Fred Johns, paint grinder, 2, Haddon Grove, Levenshulme, claimed £50 from the Stockport Corporation for injuries received, and loss of wages, alleged to be due to the negligence of a tram driver. The plaintiff's case was that as he was taking his seat on the top of a Corporation tramcar the car was suddenly pulled up, with the result that he was thrown to the floor and sustained injuries to his shoulder. It was alleged that the car driver was not driving in a proper and skilful way. The defence was that the car was travelling at a reasonable speed, and that the driver was compelled to use the electric brake to avoid a serious collision with a cart. Negligence was denied.

Judge Brown, holding that there was no evidence of negligence, gave judgment for the Corporation.

Workmen's Compensation.

At Oldham County Court on October 15th, sanction was given to an agreement under which Samuel Hinchcliffe, electrical engineer, 19, Balfour Street, agreed to pay £150 to Ellen Foster, of 14, Silver Street, Oldham, in settlement of a claim for compensation in respect of the loss of her husband, who received fatal injuries recently whilst working for the respondent.

Armorduct Manufacturing Co., Ltd., *v.* H. Defries & Co.

[*German Companies trading in London.*]

In the City of London Court, on October 15th, before his Honour Judge Atherley-Jones, K.C., the Armorduct Manufacturing Co., Ltd., 6, Farringdon Avenue and Birmingham, sued H. Defries and Co., electrical engineers, 59, New Oxford Street, for £1 10s. 6d., for trade goods supplied. Defries did not dispute owing the money, but said he had paid £20 to the plaintiffs and he objected to pay the balance as the plaintiffs were a German company and alien enemies.

Mr. Liddle, plaintiffs' solicitor, said that the company was registered in London and the Courts had held that they could trade here.

Mr. H. F. Marchant, secretary of the plaintiff company, who said that he was a "Man of Kent," stated that the company was registered eight years ago: The authorised issue was £15,000, the ordinary shares being £5 each and the preference £1 each. Three English shareholders held 380 shares and the other 1,435 were held by Germans. The managing director was a naturalised German.

Judge Atherley-Jones said that the secretary seemed to have fallen amongst Germans. Upon perusing a list of shareholders he found they were practically all Germans.

Mr. Marchant added that the company employed nearly 200 workers in large works at Birmingham and they were all British.

Defendant: This company is what has been called "A Pipe Line of Gold to Germany."

Judge Atherley-Jones was sure no Englishman wanted to behave ruthlessly to German traders whatever might be done by others, and they should observe the ordinary requirements and conditions of international law. In that case if he found for the plaintiffs he would be offering the benefit of the English Courts for the purpose of ministering sustenance to the enemy. The doctrine of the alien enemy had never been expounded with absolute lucidity. While he would be shocked if a judicial person did not give protection to a German in this country against whom, say, a crime was committed if the safety and security of his person were affected, as the internal affairs of the company before him showed that the profits would go to Germany, he must dismiss the action with costs. Defendant had honestly discharged his obligations to his country in raising the question.

Mr. Liddle asked for leave to appeal, as 200 British workers would lose their employment if the company could not get in its debts.

Judge Atherley-Jones agreed.

Frank *v.* Hankow Light and Power Co., Ltd.

By this action, which was tried by Mr. Justice Joyce in the Chancery Division on Monday, October 19th, the Court was asked to decide whether the interest payable on the ordinary shares of the company was cumulative or uncumulative.

From the opening statement of Mr. Stone, who appeared for the plaintiff representing the deferred shareholders, it appeared that the company was formed in 1906, with a capital of £20,100, divided into 2,000 shares of £10 each and 2,000 deferred shares of 1s. each. From 1906 until 1913 the company carried on business with varying success, and no one seemed to have thought it worth while to raise the question at issue, but, with improvement in the company's affairs, the present action was started to enable the company to ascertain its exact position. By the prospectus it was stated that the ordinary shares were to bear a non-cumulative interest of 8 per cent., and that was confirmed by the memorandum and articles. Seven were originally issued to the seven signatories of the memorandum of association. Directors were appointed at a meeting held on January 12th, 1906, and the first meeting of these directors was held on February 2nd of that year. At a meeting on February 9th 333 of the ordinary shares were allotted, a further 235 on February 12th, 60 were allotted on February 19th, 16 on February 22nd, and 2.5 on March 1st. On February 12th the whole of the deferred shares were allotted to the vendors or their nominees. Finding that the applications for ordinary shares were not coming in as quickly as was desired, the directors at a meeting of February 9th resolved that the 8 per cent. interest payable on them should be cumulative instead of non-cumulative. A general meeting was called for February 16th, at which a resolution to the effect was pressed, and such resolution was duly confirmed at a general meeting of March 5th. Counsel, however, contended that the alteration was bad inasmuch that as the articles of association provided that the interest was non-cumulative, and persons had subscribed for shares on that footing. the company had no power to alter it.

Mr. Hughes, K.C., for the company, argued that inasmuch as there was power in the articles for the company to make alterations and also power to the directors to exercise all the powers vested in the company, the alteration was lawfully made at the meeting of directors of February 9th, but even if that were not so an effective resolution was passed at the general meeting of February 16th and confirmed at the meeting of March 5th.

His Lordship held that all the ordinary shares whether issued or not should bear cumulative interest.

OUR LEGAL QUERY COLUMN.

"A.B." writes:—"We have a number of overhead wires running from the works, joining the underground cables to the station. The overhead wires are about a quarter of a mile long and are run on private ground. The private ground is accessible from the highway, there being no fence or wall to keep people from getting on to same. I would be very glad to know how far the Board of Trade rules apply to such overhead wires.

"The overhead wires in question are slightly insulated with compounded braiding. The B.O.T. rules appear to deal with un-insulated conductors, thought it is not stated that this is the case. I take it that the fact of the conductors being insulated does not in any way alter the operation of the rules."

*** It is not quite clear from the statement of facts what is meant by the words "works" and "station" respectively; nor is it stated whether the private ground referred to belongs to the Corporation, who have power to supply electricity, or to private persons.

Assuming that the land over which the wires are suspended belongs to the Corporation, the right to suspend the wires appears to be conferred by the exception in S. 10 (b) of the schedule to the Electric Lighting Clauses Act, 1899. That sub-section provides that: "The undertakers shall not, without the express consent of the Board of Trade, and, where the local authority are not themselves the undertakers, of the local authority also, place any electric line above ground except within premises in the sole occupation or control of the undertakers, and except so much of any service line as is necessarily so placed for the purpose of supply." If the ground over which the wires run belongs to private persons it is clear that the consent of the Board of Trade must be obtained, and the regulations made by them must be complied with. It does not seem that the regulations (which are set out in Will on the Law of Electric Lighting, Traction and Power, 4th Edn., p. 385) make any distinction between covered and uncovered wires. They apply to wires of both kinds.

South Africa.—The office of H.M. Trade Commissioner for South Africa reports that an inquiry has been received there relating to the supply of machinery for making dry cells, and British manufacturers of such plant are requested to forward catalogues, addressed direct to H.M. Trade Commissioner for South Africa, P.O. Box 1,346, Cape Town.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

The Keystone Stoker.

A new type of mechanical stoker has been introduced by the Keystone Stoker Co., of 141, Milk Street, Boston, U.S.A. While it somewhat resembles a chain-grate stoker, it differs from the latter in that the grate is built up of disks mounted on bars, which rotate upon their axes as they carry the fuel along. The rotation of the disks has the advantage that clinker is broken up and prevented from sticking, so that the air spaces are kept free, and the disks are constantly presenting fresh surfaces to the fuel, while the heated parts are cooled by contact with the air on their undersides. The fuel bed being in a free state, a high draught pressure is not required, and the air-flow through the fuel is uniform, so that holes are not formed through which excess of air can enter.

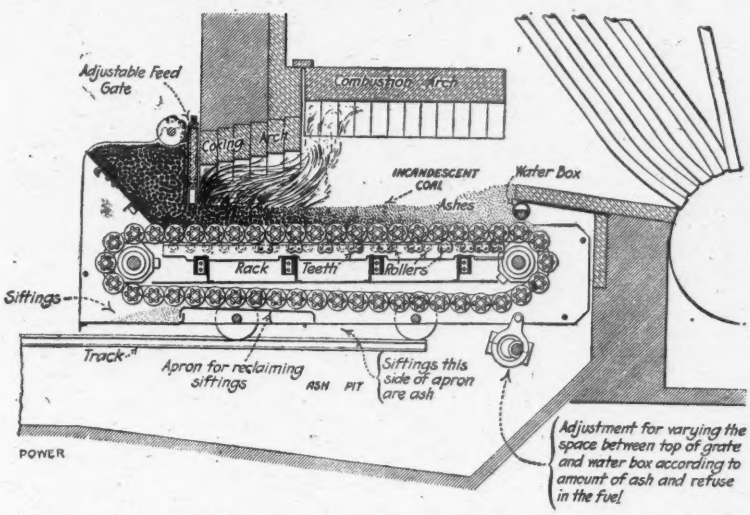


Fig. 1.—Section of Furnace with Keystone Stoker.

A new bar filled with disks can be inserted without stopping the stoker except momentarily. A water-box, not connected with the boiler, protects the bridge wall. A sheet-iron apron under the chain catches small fuel that slips through the crevices, and the chain pushes the siftings forward, depositing them on a plate; ash that falls through beyond this apron are kept separate. The stoker can be raised or lowered at the bridge wall to suit the rate of combustion required whilst in operation by the eccentric shown, and the speed of the grate and supply of fuel are also adjustable. The foregoing particulars are derived from *Power*.

Electric Control Gear for Machine Tools.

The Igranic Electric Co., Ltd., of 147, Queen Victoria Street, E.C., have developed a special range of self-acting controllers for electrically-driven machine tools, comprising simple self-acting starters of a special design for automatic stopping and starting only, self-starters arranged with pre-determined speed adjustment and self-starters with pre-determined speed adjustment and dynamic braking. One of the last mentioned is shown in fig. 2.

No sliding contacts are used, as the plunger of the operating solenoid is arranged to rotate a shaft carrying contact fingers

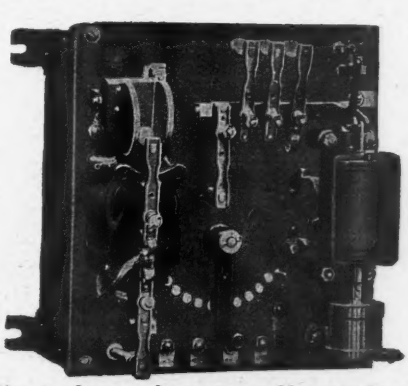


Fig. 2.—Special Starter for Machine Tools.

which have an angular displacement with respect to each other, and which causes the starting resistance to be cut out a step at a time.

The solenoid operated clapper switch which always makes and breaks the main circuit, has a magnetic blow-out, and is fitted with an auxiliary contact for operating the dynamic brake whenever the circuit is opened.

Speed is pre-determined by adjustment of the speed regulating lever at the bottom of the panel. This lever permits of from 5 to 100 per cent. speed variation by shunt field resistance. Similar controllers are made to combine shunt field and series regulating resistance.

The makers claim credit for simplicity in design, and the controllers, they say, are of specially robust construction and quite suitable for rough workshop usage.

The "Plexsim" Heat Projector.

Although the "Plexsim" projector, shown in fig. 3, does not create heat, Messrs. Simplex Conduits, Ltd., of 116, Charing Cross Road, W.C., who are introducing this speciality, claim that it certainly does use every watt put into it to the greatest advantage, and that its heat can be readily projected in a required direction. If the heat beams are directed along the floor, there is no system of electric heating so economical.

Fig. 3.—"Plexsim" Electric Heat Projector.

It will be noticed that the guard is open, so that it does not baffle the heat, and it is possible to dust the reflector without removing the guard. The element is supported at both ends, and cannot sag; the connector-box is strong and well ventilated. The "Plexsim" projector is claimed to be one of the most effective heaters at present on the market, and its price is quite competitive.

WAR ITEMS.

The Imperial Institute and Trade.—The number of inquiries received by the Imperial Institute from manufacturers, merchants, and others in Great Britain and the Colonies, relating principally to sources of supply of raw materials, methods of utilising new products from the Colonies and India, or to new or little known processes and machinery for industrial purposes, has now become so great that the Secretary of State for the Colonies has authorised the formation of a Technical Information Bureau at the Institute for dealing with them. The present is a specially opportune moment for the formation of such a Bureau, since the paralysis of German and Austrian trade and industry opens up opportunities for the development of many industries in this country and in the Colonies which have hitherto been monopolised by Germany. A very important question at the present moment is that of the supply of potash salts, which are essential in certain branches of glass and soap manufacture, and for the preparation of a large number of chemicals and manures. Germany has for many years had a practical monopoly of this industry, owing to her possession of the great potash mines of Stassfurt. The only country which has made any attempt to break this monopoly is the United States. The possible sources of supply of potash to England just now are few, and the Bureau is preparing a statement as to sources of potash, which will include some hitherto untouched for industrial purposes. An equally important matter is that of finding markets in this country for the immense quantities of raw materials from India and the Colonies formerly exported to Germany. Written inquiries for the Technical Information Bureau should be addressed to the Director, Imperial Institute.—*Morning Post.*

Faraday House Men with the Forces.—The number of the *Faraday House Journal* for the Michaelmas Term, which has just appeared, is of special interest by reason of the long list which it gives of past and present students who are serving in the Allied Forces. Photographs of a number of the men are given.

U.S. Electrical Export Trade.—In view of recent references to the part that the States might or might not play in meeting the demand for electrical manufactures outside America, we may quote from the *Electrical Review and Western Electrician* the following interesting table, showing the state of U.S. electrical export trade for the month before the war. Our contemporary says that as compared with the relatively low total of the electrical shipments in June ($1,450,437), the total in July shows a further slight decrease. The falling off as compared with July of a year ago is very striking, however, all classes of electrical exports but two showing shrinkage. The Government report for July opens a new fiscal year, and at this time an additional class has been included in the detailed electrical figures, namely, meters and other measuring instruments. The number of articles shipped in the four classes for which numbers are reported were as follows in July: Fans, 1,851; arc lamps, 86; carbon lamps, 20,424; metal-filament lamps, 49,583.

Articles.	July, 1914.	July, 1913.
Batteries	$59,714	$44,084
Dynamos or generators	195,983	246,595
Fans	23,629	40,217
Insulated wire and cables	127,697	147,948
Interior wiring supplies, &c. (including fixtures)	45,077	68,695
Lamps—		
Arc	1,672	16,423
Carbon-filament	3,143	22,582
Metal-filament	13,581	30,847
Meters and other measuring instruments	31,585	—
Motors	161,798	501,783
Static transformers	72,443	207,314
Telegraph instruments (including wireless apparatus)	5,340	3,402
Telephones	59,347	77,969
All other	614,851	910,643
Total	$1,415,360	$2,318,502

Canadian General Electric Engineers for the Front.—The *Canadian Manufacturer* states that, on August 6th, Mr. Frederick Nicholls, president of the Canadian General Electric, sent a telegram to Sir R. L. Borden, Premier of Canada, stating that the directors of the company, after full consideration, and having regard to the present serious war situation, "have resolved to submit to your Government an offer to raise, equip and pay the salaries of a company of 25 skilled electrical and mechanical operatives who would be available for service in any part of the Dominion, and be under the control of the Minister of Militia as part of the Canadian forces. Probably their services could best be utilised in the erection, repair and maintenance of wireless telegraph stations, cable stations, bridges, transport vehicles, artillery, &c."

Mr. Borden immediately replied:—"The Government of Canada warmly appreciate patriotic offer of Canadian General Electric Co., and send their sincere thanks. Minister of Militia will communicate with you thereon."

The Corps of Electrical and Mechanical Engineers, under Capt. H. Ritchie, has been divided into three sections, as follows:—

For Quebec.—Messrs. W. J. Swanger, R. W. Nurse, George Monaghan, George Hillier, C. Pink, P. Foster, H. Galvin, of Peterboro, and Colin C. Rous, of Toronto.

For Halifax.—Messrs. H. S. McKean, J. C. Munro, Clarence Henry, E. S. Shill, R. Bethune, A. J. Palmer, of Peterboro, and F. G. Jackson, Edward Crockford, of Toronto.

For Esquimalt.—Messrs. H. Ritchie, Chas. Stewart, H. S. Elliott, W. S. Johnson, H. Williams, J. S. Dunlop, of Peterboro, and A. T. McLean, Harold Bastard, Alex. Hardie, of Toronto.

Engineering Works in Belgium.—We read in the *Machinery Market* that the Institution of Automobile Engineers has been informed by the English manager of the F.N. Co. that M. Galopin, who acted as host to the Institution in their summer meeting in Belgium, has written to say that the factory at Liége is perfectly intact, and that the clerical departments are back at work preparing for next year's programme. Another Liége factory—that of the Société John Cockerill—is still at work executing orders. The Derihon factory, also at Liége, has not been destroyed, but no work is being done. No definite news has been received in regard to the works of Messrs. Dyle & Bacalan, at Louvain, but it is believed that the factory is undamaged, though the offices have been destroyed and the hands dispersed. The Minerva Works at Antwerp were not injured by Zeppelins, though attempts were made upon them. The factory at the time of writing was at work, though some of its energies have been diverted from the manufacture of cars. Engineers will be particularly pleased to learn that Messrs. Greiner, père et fils, are all well, and that the factory of Messrs. Mabille & R. Pelgrims, at Mariemont, though it has been in the thick of the fighting, is undamaged, and is actually at work.

Board of Trade Assistance.—In connection with their trade war campaign the Board of Trade have received a very large number of inquiries for names of sellers or buyers of articles of which the sources of supply or markets have been interfered with by the war. Special arrangements have been made in the Commercial Intelligence Branch of the Board of Trade for dealing with the inquiries, and lists are being prepared and circulated of articles which inquirers desire (*a*) to purchase and (*b*) to sell. The first and second lists were recently published, and the third list, in which these are incorporated, is now ready and may be obtained on application to the branch. Firms interested in any of the goods mentioned, either as buyers or sellers, should communicate with the director of the Commercial Intelligence Branch, Board of Trade, 73, Basinghall Street, London, E.C.

Exports Prohibited.—By an Order in Council the export of graphite, suitable for the manufacture of crucibles, to certain countries, and of compasses, and signalling lamps operated by electricity, to all destinations, is prohibited.

Northampton Tramway Managership.—Matters at Northampton relative to the position of Mr. J. Gottschalk, the Corporation tramway manager, who is of German birth, and who did not obtain his naturalisation papers until after the outbreak of the war, have assumed the character of a deadlock. As we hinted last week, there is a probability of municipal elections being fought upon the question of whether he should be retained, as decided by the Council at a special meeting, or discharged. We understand that the Mayor-Elect, Councillor F. C. Parker, has intimated that he will have to reconsider his acceptance of office if elections take place. At the beginning of this week there appeared every likelihood that an agreement would be arrived at between the pro and anti-Gottschalk parties. Those who favour Mr. Gottschalk's retention made a suggestion to the other side that he be suspended during the war, with a payment of £200 a year. With this end in view representatives waited upon the anti-Gottschalk party at a meeting on Monday evening. After they had retired, however, the following resolution was carried, "That Mr. Gottschalk be unconditionally discharged, and that it be left to the Council as to what compensation they think fit to give him." There was a decided feeling at the meeting in favour of a compromise being arrived at. The resolution is to be sent to a meeting of the Tramways Committee, who may possibly suspend Mr. Gottschalk during the war, and thus cut the ground from beneath the feet of the agitators for his dismissal, who have six candidates ready to fight the elections. A retiring Councillor in favour of Mr. Gottschalk's retention said, at a meeting on Monday, that the "town has been practically turned topsy-turvy by the regrettable agitation." The matter is far from a party question, as Unionists, Liberals and Socialists are ranged on either side. One of Mr. Gottschalk's sons who was in the British Army has again volunteered for service.

Not Enemy Vacuum Cleaners.—Messrs. Duncan Watson and Co., of Berners Street, W., wish it to be clearly understood that no part or parts of their electric vacuum cleaners are made in, or imported from, Germany or Austria.

Electricity Works Insurance.—The Shoreditch B.C., on the recommendation of the Electricity Committee, has taken out a policy at Lloyds for the insurance against bombs, riots, or civil commotion, on Whiston Street power station for £30,000, and on Coronet Street power station and refuse destructor for £20,000, the rate being 5s. per cent.

Manchester Tramwaymen at the Front.—There has been a remarkable response from employés of the tramways department of the Manchester Corporation, and Mr. McElroy, the general manager, has prepared and issued a roll of honour. The list of men who have joined the Colours contains the names of 804 employés of the department, representing all grades of the service.

Practical Service.—The British Telephone Supply Co., of 4, Slaney Street, Birmingham, recently fitted up the Military Hospital at Edgbaston, Birmingham, with a private telephone system to the approximate value of £140, and undertook to maintain it so long as required, entirely free of charge; the company also installed a connection for the Belgian Refugee Committee to the value of £14, free of charge. This is a practical form of patriotic service which cannot be too highly commended, and we hope it will induce other branches of the electrical trades to assist where they can, for gifts of this nature are often more valuable than money.

Carbons for Melbourne.—According to a report appearing in the *Melbourne Age* for September 8th, it seems that at a meeting of the Melbourne City Council, endorsement was given to the action of the Electric Supply Committee concerning the tender of Mr. C. W. Webster for the supply of arc lamp carbons. "The Council's London agents, Messrs. M'Ilwraith, M'Eacharn & Co., had cabled to the effect that the contractor had stated that, owing to the enormous advances of raw material, he could only accept the contract at an advance of 10 per cent. on the tender price, £2,261, cash to be paid in full against bills of lading, and subject to a war risk of about £5 per cent. The cable stated that carbons would presently be treated as contraband. The Committee replied requesting the agents to make the best possible arrangements in connection with the contract."

Active Service Allowances.—The Leigh Corporation Finance Committee has passed a resolution to pay certain officials 10s. per week whilst on active service, and at a meeting of the T.C. last week it was moved that this should be referred back. It was stated that a decision had been come to that employés who enlisted should have their pay made up to their wages as received from the Corporation, and, it was argued, that there should be no differentiation between officials and ordinary workmen. There was no seconder, and the minute was passed. It was explained that the officials concerned had no dependents.

The Bradford City Council has decided to pay 10s. per week to the dependents of employés joining the military forces. The decision arose out of a proposition by the Tramways Committee in respect of its workers.

An Electrical Alien.—Of a number of aliens arrested last week at Crewe for internment, one was an Austrian employed by a local electrical firm.

Roll of Honour.—Ernest Hadfield, 30, of Stalybridge, who was a conductor on the Joint Board Tramways, has died in the Manners English Hospital at Mons.

W. Burns, a conductor in the Salford tramways department, has been killed at the front.

Private Richard Wareing, of the Loyal North Lancs. Regiment, who before joining the army was an assistant electrician at Rossall College, near Blackpool, has died from wounds received in action at Vendresse.

News has been received of the death of Gunner James Bradburn (R.F.A.). Prior to being called up as a Reservist, he was employed as a driver by the Burnley Corporation tramways department.

At the last meeting of the Hackney B.C., the Electricity Committee reported that notification had been received from the Admiralty, that able seaman J. Singer, of H.M.S. *Hogue* (Naval Reservist), who, previously to being mobilised, was employed by the Council as an arc lamp trimmer, had not been reported in the list of survivors up to the present. The Committee recommends that £10 be paid to the widow as death allowance, together with £4 13s. 11d., the amount of the workmen's contributions to the Superannuation Fund.

Personal.—Mr. A. H. Bulton, of the staff of the Bromley (Kent) E.L. and Power Co., has joined the 5th Battalion Royal West Kent Regiment for active service.

Mr. John Bond, of the Royal Naval Division, formerly an employé at the works of the St. Helens Cable Co., has been under fire in the trenches at Antwerp.

BUSINESS NOTES.

Consular Notes.—JAPAN.—The report of Mr. E. F. Crowe, Commercial Attaché to H.M. Embassy in Japan, which has just been issued, not merely deals with last year's trade results, but also makes some interesting deductions therefrom relative to present prospects. Commenting on the increase of 22 per cent. shown in the value of machinery imports (these figures were published in our issue of October 2nd), he says that these returns are, to a certain extent, misleading, because, instead of representing activity in 1913, they should be taken as indications of the optimistic feeling which prevailed as to the future in 1911, inasmuch as a large portion of the machinery arriving last year was ordered 12 months or more previously. At present there is a comparative cessation of new works and of development of existing factories, so that the outlook for the next year or two is not very bright. Although Japan still imports machinery in such large quantities, it is interesting to note that there has been solid development on the part of Japanese machinery makers. In the case of gas plant for lighting and power it has been quite remarkable. They are making suction producers, gas engines, retort furnaces, and are building complete gas works. Practically all the appliances required by gas companies are now made in Japan, including meters, stoves, burners, lamps, glassware, and mantles. Rubber manufacturers have not appeared to benefit by the lower cost of material. The demand for rubber manufactures seems to be more than met by the mills already in existence, and competition in sales has been exceedingly keen. The net results have not been satisfactory in the mechanical branch of the industry, and the smaller concerns have, in several instances, suffered correspondingly. The electrical branch of the industry remains as hitherto the more important of the two branches, but it has shown no noteworthy development during the past year, and manufacturers generally complain that work has been slack owing to the paucity of Government orders. The principal mills in this branch appear to be devoting considerable attention to other methods of insulation, such as paper and lead covering. It is more particularly in this division of the manufacture of insulated wires that progress has been made.

Japan's production of copper increased from about 66,000 to 75,000 tons. Export figures show an advance from 38,868 to 42,345 tons, and the home consumption also grew considerably.

Adverting to the matter of Japan's imports of machinery, the United Kingdom remains well at the head of the list of suppliers, but her share in the trade has not advanced as much as that of Germany, the rates of increase being 19 and 33 per cent. respectively. Germany retained her commanding position in the supply of water turbines, and she was successful in obtaining important orders for some large cranes and two or three big gas engines. This accounts for the important advance shown by Germany, compared with 1912. Taking it all in all, there was no very remarkable change in the United Kingdom's position, or in the character of her trade with Japan, and it is an interesting fact that in spite of the obstacles in the shape of tariffs and bounties the total business done between the two countries goes on growing year by year, and is now more than three times as much as the annual average for the years 1893-95, when the first serious changes were made in the tariffs, and 12 per cent. larger than in 1911, when the second and latest revision took place.

ROUMANIA.—In our Consul-General's report on the trade of Roumania there is good evidence that that country is one to which British manufacturers may usefully direct their attention as soon as ever the European situation permits. Our chief competitors in the Roumanian market are Germany and Austria-Hungary. With these two countries the United Kingdom shares over 70 per cent. of the total import trade, but her own quota shows a slight but steady decrease. France maintains an almost steady position, but both Italy and Belgium are annually contributing a larger proportion of the total imports. Geographical position and cheaper freights will tell, particularly in the case of goods, such as textiles and machinery, which are of high value in relation to their bulk, and it is in these lines that the United Kingdom is losing ground. But the advantage of railway transport is less marked in the case of bulky goods, and here it is that British merchants are increasing their share of the trade. The United States, whose wares a few years ago were rarely seen in Roumania, is coming rapidly to the front. Germany has in the past supplied more than one-half of Roumania's requirements in machinery, Austria-Hungary taking second place, whilst the United Kingdom was over-reached by the United States, and took only the fourth position. Agricultural machinery (reapers) accounts for the United States' advance. Hydraulic machinery came mostly from the United Kingdom and Germany; steam engines almost entirely from Germany and Austria-Hungary; oil engines from Germany, the United Kingdom and Switzerland; portable engines and threshing machines from the United Kingdom, Germany and Austria-Hungary; printing, paper-making and textile machinery practically all from Germany; machine tools from Germany and Austria-Hungary; electrical machinery and apparatus from Germany, Austria-Hungary and France. Our Consul-General has little doubt that British interests have suffered greatly in the past from the lack of proper representation, and British merchants are strongly recommended to follow their rivals' example and send out capable and energetic travellers to study the conditions and needs of the market.

TURKEY.—According to the recently issued report by the British Consul at Constantinople, the total value of steam and oil engines and parts imported into Turkey in 1911-12 was £342,000, the British share was £159,000, an increase of 50 per cent. compared with the previous year. A line in which the Consul thinks the demand should increase is pumps. The total value imported was £28,000, the United Kingdom holding the first place with £7,500. Other items of electrical interest are:—Copper sheets and plates, £269,000 (United Kingdom, £153,000); electrical material, £140,000 (United Kingdom, £20,000).

RUSSIA.—In his report on the foreign commerce of Russia, Mr. Consul Woodhouse notes that amongst the goods in which increasing imports were shown in 1913 were dynamo-electrical machines and electric motors, parts of machinery and apparatus, scientific instruments, motor-cars, manufactures of copper, machinery of cast-iron, iron and steel, and, amongst raw and half-manufactured materials, india-rubber, gutta-percha, iron and lead. The imports of raw and half-manufactured materials in 1913 exceeded the average for the quinquennial period of 1908-12 by 26·6 per cent., and manufactured articles by no less than 47·7 per cent. As regards Great Britain's participation in Russian trade, imports from the United Kingdom into Russia in 1913 proved to be in excess of those in 1912 by 22·3 per cent. Compared with the total import trade of Russia the share falling to the United Kingdom was 31·9 per cent. as against 13·5 per cent. in 1912, whilst Germany's share amounted to 52·7 per cent. as against 50·1 per cent. in 1912.

Bankruptcy Proceedings.—Charles Blake (Bilston Electrical Co.), Bilston.—Trustee (S. W. Page, 30, Lichfield Street, Wolverhampton) released October 5th, 1914.

Herbert James Godfrey, electrical engineer, 23, Lucien Road, Tooting, London; 188, Balham High Road, London.—This debtor attended at the Court House, Wandsworth, on October 15th, for his adjourned public examination on accounts showing liabilities £581, and assets £166. The Official Receiver had no further questions to ask the debtor, and after the latter had read the shorthand notes of his previous examination, and answered the formal questions of the Registrar, he was allowed to pass.

Book Notices.—"The Electron Theory of Matter." By O. W. Richardson. London: Cambridge University Press. Price 18s. net.

"Polyphase Currents." By A. Still. London: Whittaker and Co. Price 6s. net

"Electric Light Fitting." By S. C. Batstone. London: Whittaker & Co. Price 5s. net.

"Board of Education Regulations and Syllabuses for Examinations in Science and Technology, 1915." London: Eyre and Spottiswoode. Price 3d.

"A School Electricity." By C. J. L. Wagstaff. Cambridge: *University Press*. 5s. net.

"Principles of Electrical Measurements." By A. W. Smith. London: Hill Publishing Co., Ltd. 8s. 4d. net.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXIII. October. New York: The Society. Price $1.

Catalogues and Lists.—Messrs. Townshend's Art Metal Co., Ltd., Ernest Street, Holloway Head, Birmingham.—Two illustrated folders giving brief particulars and prices of "Calor" electric cooking and heating appliances, and "Calor" red hot electric fires. Both folders are so prepared that traders can have their own names printed on them.

Messrs. Musgrave & Co., Ltd., St. Ann's Ironworks, Belfast.—Illustrated postal card showing their induced draught fan and engine, and tabulating the percentages of heat losses in flue gases.

The Anglo-Colonial Engineering Co., Ltd., 13, City Road, London, E.C.—Sixty-eight-page illustrated catalogue, giving information and tabulated data and prices respecting D.C. and A.C. dynamos and motors, transformers, forge blowers, drills, starters, &c.

The Brompton and Kensington Accessories Co., Ltd., 254-260, Earl's Court Road, London, S.W.—54-page catalogue containing large illustrations of the company's various "Universal" electrical home needs. A description of the "Universal" heating unit and the connecting plug and terminals, which are common to all Universal heating appliances, is given. The "needs," which are priced, and of which the weights and current consumptions are tabulated, comprise coffee percolators and urns, tea pots, samovars, chafing dishes, egg cookers, kettles, portable water heaters, toasters, grills, disk stoves, heating pads, portable luminous radiators, irons, &c. We understand that the sale of these Universal appliances is increasing very rapidly.

International Time Recording Co., Ltd., 30-32, Farringdon Road, London, E.C.—"In the Balance" is the title of a 24-page illustrated catalogue of the Day, Bundy, International and Rochester card systems of automatic time-keeping and job-costing.

Messrs. Donovan & Co., 47, Cornwall Street, Birmingham.—Illustrated leaflets giving particulars and prices of insulated lamp-holders and hand-lamps, Barwick starting switches, and "Safuse" distribution boards.

The British Thomson-Houston Co., Ltd., of 77, Upper Thames Street, London, E.C., have prepared a "Mazda" poster stamp, the feature of which is their excellent Union Jack poster design. Contractors and others can have quantities of these stamps for use in their efforts to sell British-made lamps.

The Jackson Electric Stove Co., Ltd., 38, Blandford Street, London, W.—Postcards giving particulars (illustrated) and prices of electric cookers and electric fires.

Sceando Lamp Co., 7, Blackfriars Street, Manchester.—Circular giving prices of "Sceando" drawn wire metal lamps.

British Thomson-Houston Co., Ltd., Rugby.—Price list No. 7,510 A (8 pages) gives illustrated descriptions, with tabulated weights, dimensions, prices, &c., of B.T.H. radiant-electric fires, convectors for A.C. or D.C. circuits, vertical rectangular convectors (non-luminous and semi-luminous); vertical and horizontal cylindrical convectors; and state, study and tramcar-type convectors.

The Magneto Position. — The question of British magnetos for British motor cars continues to attract attention in motoring and motor trade circles. Our contemporary, the *Automobile Engineer*, reports that it has lately been making careful inquiry into the position of affairs in England with regard to the magneto market, "and it is obvious that all the British makers of such machines, taken together, are quite unable to cope with the demand which may be expected immediately upon the exhaustion of the Bosch stock in this country. Great preparations are being made for British manufacture upon a large scale, and there should be no lack of home-produced magnetos in from 12 to 18 months from the present date. At the moment, however, there is a real shortage in supply, and when the touring car demand returns to normal the position may become very difficult. . . . We appeal to manufacturers to give the English magneto a trial."

For Sale.—The Postmaster-General invites tenders for the purchase of certain electrical power plant, now at Head P.O., Glasgow. Swansea Electricity Department has for disposal a Lancashire boiler. Particulars are given in our advertisement pages.

Trade Announcements.—Mr. Duncan Watson has purchased, as a going concern, the old-established West-End electrical contracting business of E. L. Berry, Harrison & Co., of Whitcomb Street, W., including the goodwill, patents, lease, plant and stock-in-trade. Mr. Watson will carry on the business under its old title at 62, Berners Street, W.

Theft.—Robert Richmond, driller, of Lorne Grove, Urmston, charged at Manchester recently with stealing scrap brass and copper and some fitters' tools of the value of £3 4s. 2d., the property of his employers, Messrs. Glover, Ltd., Trafford Park, was sentenced to two months' imprisonment, with hard labour.

Liquidations.—The Pump and Power Co., Ltd.—Particulars of claims must be sent by December 13th to the liquidator, Mr. L. R. Sankey, 5, Coleman Street, E.C.

Wright's Electrical Sales Co., Ltd.—A meeting of creditors will be held on November 20th at West Bar Chambers, Boar Lane, Leeds, to hear an account of the winding up from the liquidator, Mr. A. France.

Plant Required on Loan.—The Dartford U.D.C. wants a 200 to 300-kw. high-speed steam generator set on loan. Particulars appear in our "Official Notices" to-day.

LIGHTING and POWER NOTES.

Aberdeen.—Power Supply.—The Corporation Electricity Committee has agreed to give an extra supply of electricity to Grandholm works at the terms arranged last year. The Donside paper works are also to receive a supply.

Acton.—Annual Report.—The statement of accounts of the Electricity undertaking for the year ended December 31st last shows a profit of £1,314, or 1$\frac{1}{10}$ per cent. upon the capital expended, but until the undertaking can show a profit of 6½ per cent. the Council does not benefit. Last year there was a decrease of ½d. per unit, sold without any corresponding decrease in generation costs.

Australia.—The Leederville Council, W.A., has decided to install a generating plant unless better terms for current can be obtained from the Perth City Council than those already submitted.

North Shore Electricity Scheme.—The Sydney Municipal Council has requested Prof. Gibson, of the Brisbane University, to design two steel towers to carry 33,000-volt transmission lines over the Parramatta River at Five Dock in connection with the supply of energy to the North Shore municipalities.

The Melbourne (Vic.) City Council has agreed to supply the Williamstown Council with electrical energy in bulk at £5 per kw. of maximum demand plus ·65d. per unit. The Melbourne Council will lay a cable at a cost of £1,100 across Fishermen's Bend, and steps will at once be taken to install electricity within the municipality.—*Tenders.*

The Warrnambool (Vic.) Shire Council is having a canvass of the town made with the view of ascertaining the probable consumption of electricity in the event of the Council installing a service.

The Northcote (Vic.) Council has decided to borrow £9,300 for the purpose of extending the electric lighting scheme, &c.

Bradford.—Annual Report.—Additional particulars, just issued, relating to the working of the Corporation electricity undertaking, show that of the 28 million units sold in the year 1913-14, roughly 7½ million were for bulk supply, 5 million for general power and heating, and 11¼ million for traction purposes. The greatest progress was made in bulk supplies, which took, roughly, 2 million units extra, some 445 motors of 6,400 h.p. coming under this heading. The general supply included 2,193 motors of 10,000 h.p. The generating plant installed remained practically stationary at 16,800 kw., and the maximum load at 11,522 kw., represented an increase of about 1,100 kw. Some interesting data regarding the progress of the domestic tariff in the town are given, showing that in 1914 56·5 per cent. of the lighting consumers (633 against 487 on ordinary rates) used the domestic tariff, as against 52·6 in 1913, while the average units used per D.T. consumer increased from 933 to 970. As has previously been mentioned in our columns, a Westinghouse 5,000-kw. turbine set is being obtained in place of the Bergmann set originally ordered; 27 H.T. transformer chambers are now in use, with 42 transformers of from 15 to 312 k.v.a. capacity, making a total of 5,914 k.v.a.; and the E.H.T. feeders now reach 53 miles in length. The publicity department and showroom are reported to be increasingly successful, many of the contractors drawing on the latter for stock. A complete electric cooking outfit for 500 persons is being installed at the Central Baths, and it is hoped that the city restaurants will be encouraged to try electric cooking in the future. The half-watt lamp has been substituted for the arc lamp in a number of public lamps.

Brentwood.—E.L. Scheme.—The U.D.C. has appointed two members to represent the Council at a conference to consider an electric supply scheme for the town.

Bromley (Kent).—The E.L. and Power Co. has reduced the price of energy for heating, cooking, and power to 1½d. per unit.

Clun.—E.L. Scheme.—The inauguration of the electric supply took place on October 10th, at the power house, when the chairman of the P.C. switched on the street lighting.

Croydon.—Greater London Supply.—The delegates to the recent L.C.C. conference on the electricity supply of Greater London have reported to the B.C. After Ald. Miller had moved the report, and pointed out that the borough was seriously affected by the scheme, several other speakers criticised the proposals adversely, and an amendment that the report be not received (moved with a view to giving the Council as a whole an opportunity to express its views) was carried by a large majority.

Easebourne (Sussex).—The P.C. has passed a resolution in favour of the use of overhead lines for the supply of electricity to the parish. This will be forwarded to the R.D.C.

Ealing.—The T.C. has decided to give current free for one year, to the value of £40, to a Belgian Refugees' Home established in the borough.

Edinburgh.—Public Lighting Charges.—The Electric Lighting Committee has made a readjustment in the charges for lighting the public lamps in the city. In lieu of the present charge of £7 10s. per lamp, a new rate is to be substituted, £9 16s. 8d. per lamp for those in use all night, and £5 3s. 8d. for those lit only a portion of the night. This means a saving of some £700 per annum.

Flint.—Prov. Order.—By seven votes to six, the T.C. has referred back to a Committee the recommendation to apply to the B. of T. for a prov. order for E.L. The scheme proposed includes overhead mains as a main principle, and the capital outlay is estimated at £6,000. The object of those supporting reference back is to obtain further advice on the whole matter.

Hastings.—Mains Extension.—The L.G.B. has suggested to the T.C., which applied for a loan of £1,185 for the laying of cables on the Brisco Estate, that the expenditure should be met out of the amount in hand for cables. The T.C. has adopted the suggestion, although it was not desired to deplete the previous loan of £5,000 to such a large extent.

Heywood.—Bulk Supply.—The T.C. has accepted the terms of the Bury Corporation for a supply of electricity in bulk. It has also adopted an overhead transmission scheme for this supply.

Application for permission to borrow an additional £710 for the electricity works is to be made.

The Health Committee has acceded to an application for the use of land at Heap Bridge for a sub-station.

(*Continued on page* 563.)

ELECTRICITY SUPPLY IN BASINGSTOKE.

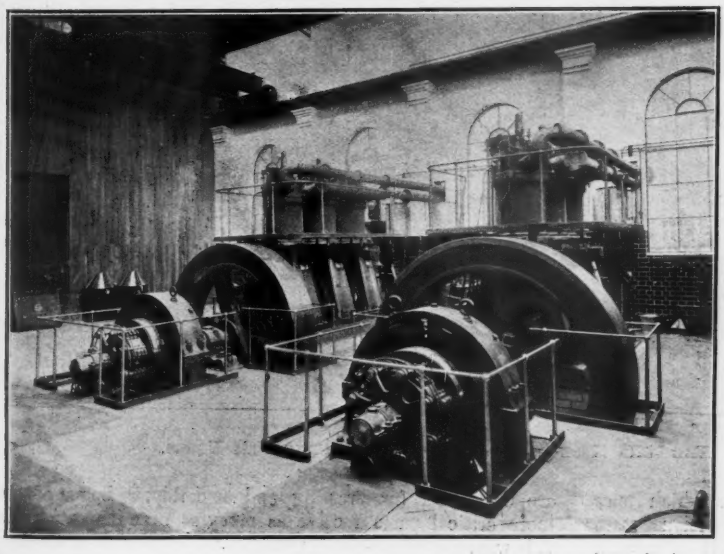
On Thursday afternoon, last week, the old town of Basingstoke was the scene of an interesting little ceremony, when the Corporation's new generating station was opened by the chairman of the Electricity Committee, Councillor Tigwell, and the machinery was officially started by the Mayor, Mr. Cannon.

It was in 1912 that the Town Council finally decided that the borough, which has a population of, roughly, 12,000 inhabitants, would benefit by the introduction of electricity for both lighting and power purposes, for although essentially an agricultural community, the town is an important railway centre, and contains well-known engineering and clothing factories.

The new generating plant, which was jointly designed by the borough surveyor and Mr. J. B. Morgan, resident engineer to the Horsham Council's electrical undertaking, has cost, roughly, £13,000; Mr. George Broadhurst, of Worthing, was appointed in March last to supervise the carrying out of the contracts, and subsequently as electrical engineer to the undertaking.

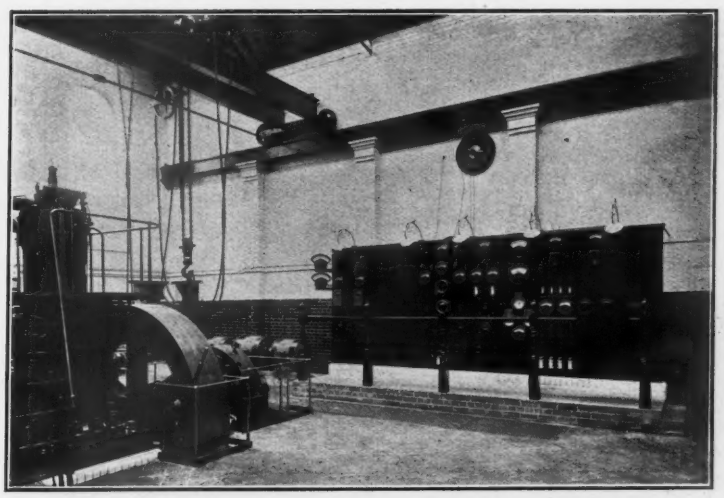
The new station is a brick building, containing a light and airy engine room, with a battery room adjoining and offices, test room, workshop, &c., facing on to Brook Street.

One of the Battery Rooms, Basingstoke.



Diesel Generating Plant, Basingstoke.

In the engine room are installed two 150-H.P. Morley-Güldner Diesel engines, constructed by Messrs. Cole, Marchent & Morley, who have taken over the construction of the Güldner engine in this country—Dr. Güldner being at one time chief engineer and constructor for the Diesel firm.



The Main Switchboard, Basingstoke Electricity Works.

The engines are three-cylinder machines, with an independent two-stage intercooled compressor attached at one end. The cylinders are supported on standards, and each is complete with its own fuel pump.

The cam shaft is carried on the standards, not on the cylinders, and the valves on the heads of the latter are operated by vertical tappet rods.

Each engine is provided with a blast and two starting (compressed air) bottles, the starting bottles being of extra large size, sufficient for starting three times; also with a fuel-feed tank and paraffin tank for starting purposes.

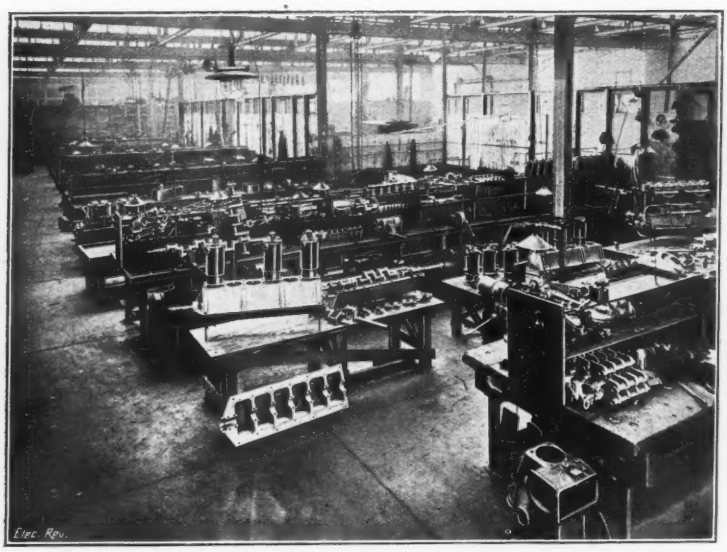
A 200-gallon fuel storage tank in the engine room supplies the engine tanks by gravity, and is itself coupled through a 1½-in. pipe line (fitted with a hand pump) to an outside storage tank with a capacity of 22 tons of oil.

The cooling water for the cylinder jackets, on account of its hardness, is first passed through a Boby water softener and subsequently circulated between the jackets and a Heenan & Froude cooler of the helical type, which is operated by a 5-H.P. Phœnix motor. Each engine is direct coupled to a 100-KW. Phœnix dynamo wound for 460-500 volts, the engine speed being 210 R.P.M. The generators are of the interpole type and shunt wound. On test these engines have shown a fuel consumption of ·64 lb. per KW.-hour on full load, ·69 lb. and ·70 lb. respectively on three-quarter and half loads.

This plant operates in conjunction with a 300 ampere-hour Hart battery, the two halves of which are installed on separate floors, and the boxes made large enough for a prospective increase in battery capacity to 500 ampere-hours. A balancer to deal with 100 amperes out-of-balance current and a 42-H.P. motor-driven booster for battery charging—both supplied by the Phœnix Dynamo Co.—are installed in the engine room, the whole plant being controlled from a ten-panel main switchboard supplied by Messrs. Cox-Walkers, Ltd.

The board contains the necessary panels for the generators, battery, and balancer, also a middle wire and two feeder panels, together with certain spares; the regulating switches for the battery are mounted on the wall behind the board, at a suitable level for the respective battery connections. The switch spindles are coupled by chain and sprocket wheels and operated from the battery panel.

The engine room, which is spanned by a 6-ton Morris hand-travelling crane, contains space for an additional generating set, and a temporary end is provided in view of future extensions.



The General Erecting Shop, Aster Works.

The supply system is the usual three-wire one with 460 volts across the outers, and the initial feeder and distribution system has been carried out by Messrs. Johnson & Phillips.

Two lead-covered triple feeders have been laid to distribution pillars, from which three-core distributors are run to supply the area.

Some 70 street lamps have been converted to metal-filament lighting, and these are supplied through separate cables and controlled at the main switchboard.

The Basingstoke undertaking starts with excellent prospects; a number of consumers have been connected, and one large consumer—the South-Western Railway Co.—has entered into an agreement with the Corporation for the supply of from 50,000 to 80,000 units per annum at the flat rate of 2d. per unit, for station lighting and working the lifts and signal air compressors. In addition, the engineering, clothing, leather and other industries in the town offer considerable scope for the development of a day load.

We understand from Mr. Broadhurst, the borough electrical engineer, who kindly placed himself at our disposal during a recent visit, that active steps are being taken by means of demonstrations, &c., to popularise the use of electricity for lighting and other purposes in the town, which may congratulate itself on having made an auspicious start in the provision of what is practically a necessity of modern life.

THE ASTER ENGINE WORKS.

Through the courtesy of the Aster Engineering Co., Ltd., we were recently enabled to pay a brief visit to the company's works at Wembley, to view the well-known Aster engine in its various constructional stages.

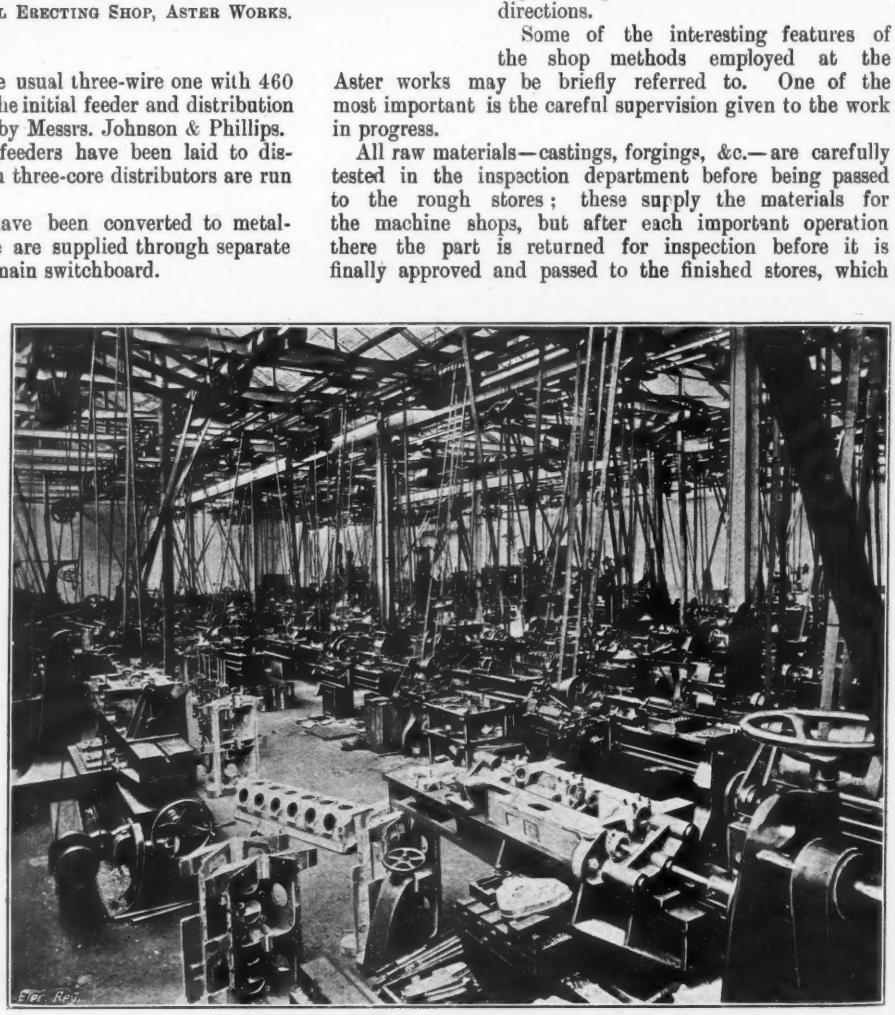
The company specialises in engines for automobile work, aeroplanes, and industrial uses, such as electric lighting, pumping, and marine propulsion, which are designed to run on petrol, paraffin, or heavy oil fuel.

So far as electrical readers are concerned, it may be of interest to record that, on the average, one complete Aster generating set is turned out per day, in addition to the engine units which are supplied direct to dynamo builders.

It is, of course, well known that only by the perfection of the constructional methods employed in the shop, could the modern automobile engine have been brought to its present highly efficient state, and although the petrol and paraffin engine for stationary industrial use, has, by comparison, an easy life, it has without doubt benefited greatly from experience gained in other more strenuous directions.

Some of the interesting features of the shop methods employed at the Aster works may be briefly referred to. One of the most important is the careful supervision given to the work in progress.

All raw materials—castings, forgings, &c.—are carefully tested in the inspection department before being passed to the rough stores; these supply the materials for the machine shops, but after each important operation there the part is returned for inspection before it is finally approved and passed to the finished stores, which

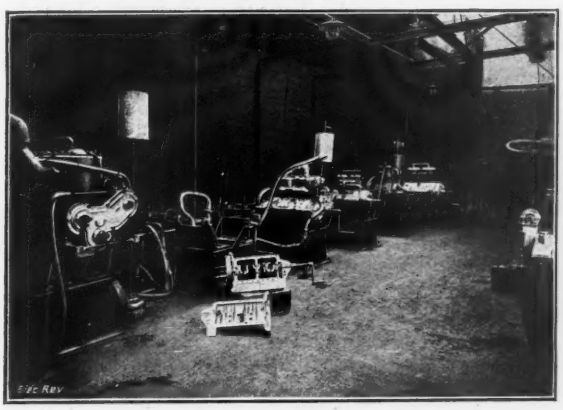


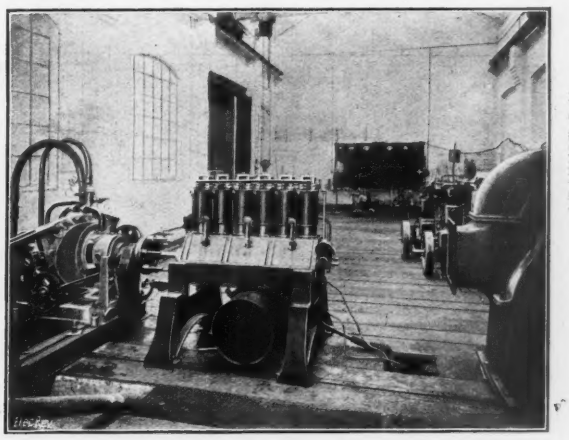
The Main Machine Shop, Aster Engineering Co.'s Works.

are drawn on for erecting and assembly. Some of the more critical parts receive as many as nine inspections in this way.

The machine-shop equipment is quite modern and

specialised, including a number of labour saving tools by well-known makers, which enables the firm to carry out the operations associated with this department in the minimum of time. The practice adopted in these works conforms with that which experience has proved to be suitable, the only just been completed, and is equipped with Heenan and Froude water dynamometers and the necessary switchboards for testing complete generating sets.





The Old and New Test Shops, Aster Engineering Co.'s Works.

methods in vogue ensuring the greatest accuracy and reliability in the finished product.

As our readers are aware, the Aster engine has achieved a considerable reputation for itself, and it is, no doubt, due in large measure to the care bestowed on its manufacture in the works that it has given such satisfaction to its numerous users.

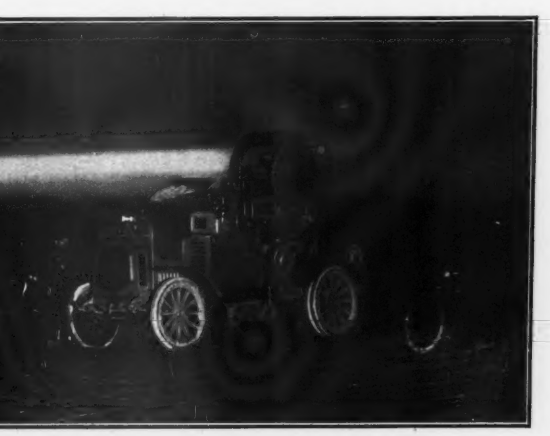
We illustrate on the previous page the main machine and erecting shops, while on this page will be found views of the old and new test-shops.

The block of buildings also includes an engine house with two gas engines working in conjunction with a producer plant for driving the shops; a smiths' shop in which are also installed muffle furnaces for case-hardening purposes; and the test rooms, one of which has

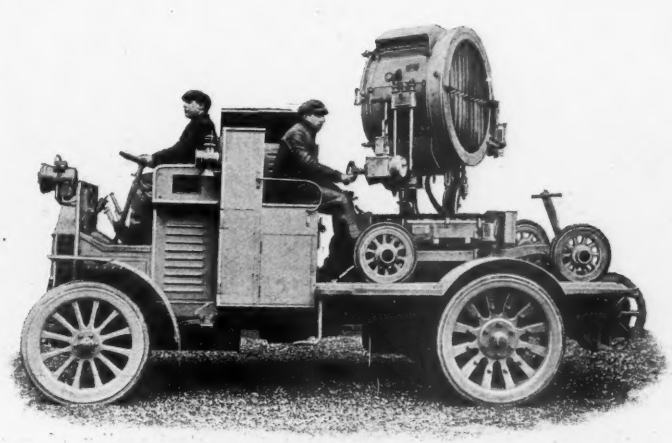
The erecting and repair shops form a separate block of buildings, and a special or "industrial" shop is set apart for electric and marine sets.

The Aster Co.'s engine products cover a wide range of sizes and types; the smallest single cylinder petrol engine standards are the 3, 5 and 7-H.P. models, with multiple cylinders the outputs range up to the 150-H.P. eight-cylinder model, the largest made by the firm. The engines can be adapted for the use of either petrol or paraffin. Semi-Diesel hot-bulb crude-oil engines for both stationary and marine purposes, in sizes between 7 and 60 H.P., are built, and amongst special work one may mention that they make the celebrated Green aeroplane engine, and portable generating sets for the Post Office, War Office and Admiralty.

In conclusion, our thanks are due to the Aster Engineering Co. for the facilities placed at our disposal on the occasion of our visit to the works.



French Military Searchlight in Operation (see page 562).

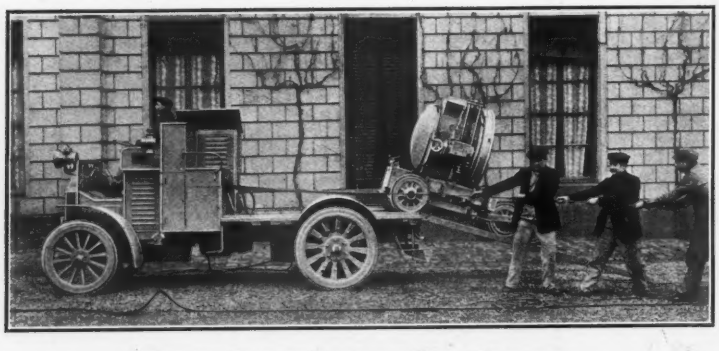


De-Dion Bouton—Breguet Automobile Searchlight in Marching Order, as used by the French Military Authorities (see page 562).

Science to Aid Industry.—The Council of the Sheffield University has approved the formation of a University Scientific Advisory Committee, in the hope of being able to render service to local manufacturers. It is suggested that the resources of the University shall be available for the purpose, either by directing manufacturers to technical literature bearing upon the difficulties presented by new problems, or by putting manufacturers into communication with suitable expert opinion, on the understanding that no work shall be done by the Committee which could readily be dealt with by local professional experts.—*Sheffield Independent.*

AUTOMOBILE SEARCHLIGHTS FOR THE FRENCH ARMY.

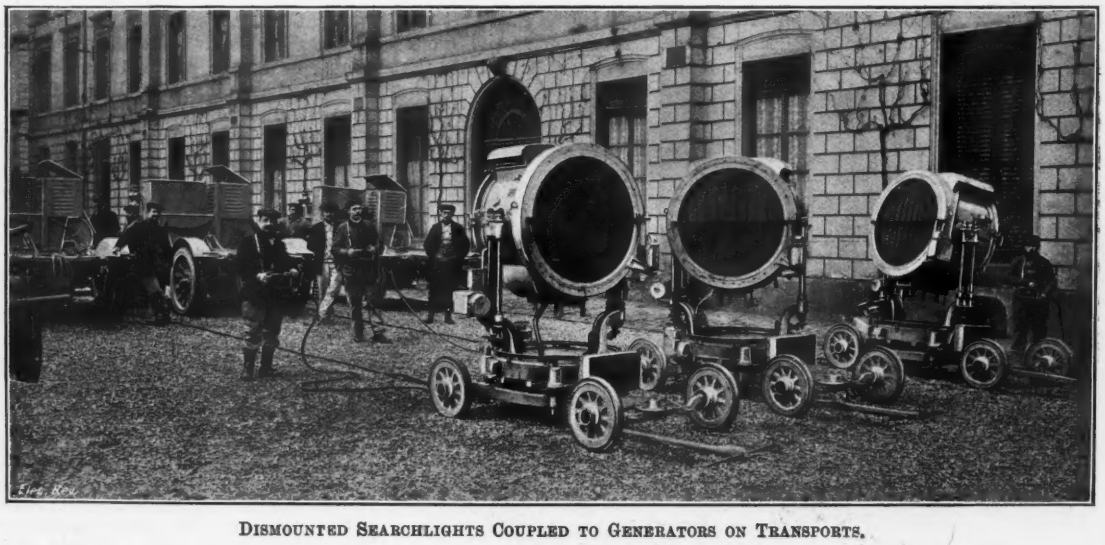
When the complete history of the European war at present in progress comes to be written, one of the outstanding features will be the important part played in it by motor vehicles. Not only are they being employed for the rapid conveyance of soldiers, for the transport of supplies of all kinds, for gun haulage and ambulance work, but they are also being used in many other directions, among those of interest to the electrical engineer being that of automobile searchlight plants. The accompanying illustrations depict a portion of the fleet of 50 such vehicles, which is being used by the French military authorities in the course of their operations against the Germans. The searchlights, which are of the Breguet pattern, are mounted on light, independent, four-wheel trucks, so arranged that they can either be used directly on the wagons on which they are transported, or they can be dismounted from the latter and located at any desired point within a range of about 100 yards of the wagon, which is provided with sloping channels or ramps and blocks and tackle for the purpose. The necessary current for the searchlights is provided by a dynamo located on the wagon at the rear of the driver's seat, and driven off the main engine. When the projectors are used independently of their means of transport, the necessary current is conducted by a cable carried on a reel, which forms part of the equipment. The projectors are mounted on turntables, so that they can be instantly swung round to any desired position; they are also adjustable as to the angle at which the powerful beam of light is projected.



Lowering Searchlight from Motor Transport.

Another interesting machine, of which the French army has a fleet of about 20, is a motor vehicle equipped with wireless telegraph receiving and dispatching apparatus. This can be quickly erected and brought into operation, and has the great advantage that, apart from direct attack, it cannot possibly be interfered with in its function of maintaining communication between widely separated points except, to some extent, by similar apparatus in the hands of the enemy. To the insidious devices of spies and the onslaughts of cavalry patrols its ethereal medium of communication is immune; there is no line to be laid down, no natural obstacle to be overcome—like the beam of the searchlight, the wireless ray instantly flashes through space to the limit of its range. It would be easy to trace other analogies between these two aids to military operations, which, apart from the ordinary telegraphs, appear to be the only types of electrical apparatus which are employed to any important extent in modern warfare. For example, both can be used for signalling, to the eye and ear respectively, and both are deficient in the important quality of secrecy; and both are dependent upon the ether for their operation.

Motor Transports with Searchlights Dismounted, showing Cable Reels, &c.



Dismounted Searchlights Coupled to Generators on Transports.

LIGHTING and POWER NOTES.

(*Continued from page* 558.)

Great Yarmouth.—Overhead Wires.—The T.C. has applied to the Port and Haven Commission for permission to carry overhead electric cables across the River Yare, in order to supply additional current to Gorleston. The matter is being dealt with by a Committee.

Hindley.—E.L. Scheme.—It was expected that the U.D.C. would be in a position to supply electricity for lighting, heating and power purposes this week.

Hurst.—Proposed E.L.—The electrical engineer at Ashton having written to the D.C. asking whether it would be disposed to consider the question of a public supply of electricity by Ashton, the Clerk to the D.C. has been instructed to inquire into the matter.

Keighley. — Works Extensions. — The T.C. has adopted the recommendation of the Electricity Committee for the purchase of a 25-ton overhead travelling crane, at a cost of £400, and the extension of the engine room at the electricity works at an estimated cost of £1,000.

London.—L.C.C. Electric Supply Scheme.—A number of conferences have already been held at the instance of the L.C.C. in regard to the Greater London electricity scheme. At one held last week various speakers expressed their antagonism to the proposals, and concluded that any such scheme if permitted to be established would be used against the lesser authorities at a future date by the L.C.C., which, it was pointed out, wanted to extend its boundaries; only one representative spoke in support of the proposals. No resolution was put to the meeting, but it was manifest from the discussion that any Bill promoted by the L.C.C. to carry into effect its scheme will meet with strenuous opposition.

Midhurst. — Overhead Wires. — The R.D.C. has rescinded the resolution sanctioning the erection of overhead wires except in Midhurst, and a Committee has been appointed to meet the representatives of the Electric Supply Co., and to discuss the best route for the wires to take and what system should be adopted.

Newport (I. of W.).—On Saturday night an explosion occurred under an electric street lamp, in consequence of which a Territorial bandsman was killed.

New Zealand.—The Christchurch Electricity Committee has notified the Council of the uncertainty of the arrival of insulator and street lamps supplies, which are of foreign manufacture. In the meantime, inquiries are being made as to stocks held in New Zealand and Australia.

Nuneaton.—The T.C. has asked the electrical engineer (Mr. Gibson) to furnish a list of the manufacturers of the goods supplied to the electricity department for the past year to Easter, for the Council to ascertain what foreign material is used, goods from Germany and Austria to be specified.

It has been decided to invite quotations from all firms with which the department has done business in the past for one or two years' supply of cables.

Prestwich.—Polefield Hall Estate is to be lighted by electricity, and the D.C. has decided to provide a special cable.

The Salford Corporation is being asked to fix five electric lamps to the tramway overhead equipment in Bury New Road, as an experiment.

South Africa.—Electric Winding.—The annual report of the Mines Department shows that the number of electric hoists licensed for transport of persons continues to increase. There were 75 induction-motor hoists, of 40,144 H.P., and 16 Ward-Leonard hoists, of 15,755 H.P., in operation at the end of the year.

Swinton and Pendlebury.—Street Lighting.—The U.D.C. has decided to purchase 300 50-C.P. and 100 100-C.P. electric lamps for the lighting of the tramway route.

Todmorden.—Mill Driving.—Recently a portion of Messrs. Fielden Bros.' mill commenced operations with power supplied by the electricity department. New plant has been installed, and H.T. cables run to the mill, where a sub-station has been built and equipped. The H.T. supply will be available throughout the town.

Truro.—E.L. Scheme.—At a meeting of the T.C. on October 13th, it was reported that Dr. Purvis had advised that the tenders sent in for the electricity scheme were within his estimate; the E.L. question has, however, been deferred until after the new Council is constituted on November 1st.

Welshpool. — Street Lighting. — The P.C. has arranged to have the streets lighted by 21 electric lamps, each of 150 C.P., at £30 for the season.

Whitehaven.—In reply to a request for a supply of current to Sandwill Quarries, the T.C., on the advice of the electrical engineer, has replied that it is impracticable to give the supply.

Whitworth.—E.L. Agreement.—The U.D.C. proposes to enter into a 15 years' agreement with the Rochdale Corporation for the supply of electricity.

TRAMWAY and RAILWAY NOTES.

Ayr.—Annual Report.—The annual accounts of the Corporation tramways department show a total revenue for the year of £19,377, being an increase of £3,081. The receipts per car-mile were 9·81d., as against 9·71d. for the previous year. The energy consumed amounted to 421,844 units, or ·91 per car-mile. Working expenses, including power charges, amounted to 5·75d. per car-mile.

Birmingham. — New Tramways. — The Tramways Committee recommends the construction of four lines of tramways and the borrowing of £128,240 to cover the cost of carrying out the work.

Blackpool.—Reduced Traffic.—Ten weeks of war has caused a reduction of £13,600 in the Corporation tramway receipts. When the war broke out the takings were £4,300 up compared with last year. They are now £9,351 down.

Bury.—The extension of the Limefield section is proceeding quickly, and it was intended to commence the new permanent way from Jericho to the borough boundary this week.

Glasgow.—Tramway Insurance, &c.—The T.C. having decided to carry its own third party insurance risks, the Tramways Committee proposes that a sum of £31,000 per annum be set aside to meet such risks, the sum to be paid in four quarterly instalments.

It is proposed that the tramways department present to the 1st Glasgow Battalion H.L.I. (which is composed almost entirely of tramway employés) the necessary equipment and instruments for a fife band.

After having had a lease of the Harbour tunnels for over a year, it is recommended by the tramways department that the T.C. should now seek Parliamentary powers to secure a 10 years' lease or working arrangement for the tunnel, at a rent of £3,000 per annum, the T.C. paying both landlords' and tenants' taxes and maintaining the works. The tunnel is being utilised for the relief of cross-river traffic, and there is a proposal for its electrification for tramway purposes.

Ilford.—At the meeting of the U.D.C. last week, the chairman of the Tramways Committee stated there had been an increase in the takings of about £3,000, as compared with the corresponding period of last year, but in addition to the £950 they paid to Barking as rent, they were paying £860 per year for current to run extra cars, which, with other expenses, amounted to £2,800 per annum, so that there was not such a big surplus as one was led to think. The Tramways Committee has decided to purchase a car from the Barking Council for £650.

The Electricity Committee has decided to make a charge of $1\frac{1}{16}$d. per unit for current supplied for traction purposes during the year ending March 31st next.

Leeds.—Half-Year's Statement.—The working of the tramways undertaking from April 1st to September 30th has resulted in a net surplus of £45,465. The total receipts—£224,185—show an increase of £1,343, and the number of passengers carried increased from 47,996,569 to 48,543,198.

Manchester.—Relief Works.—At the request of the Distress Committee, the Parks Committee has promised to consider the question of constructing a light railway to surround Heaton Park.

Mexico. — According to the *Financial Times*, it is confirmed that the Government has taken forcible possession of the property of the Mexico Tramways Co. and is working same. It is stated that no political trouble underlies this incident.

New Zealand.—The installation of electric tramways, supply of cars and equipment of sub-station for the New Plymouth Borough Council is to be carried out by Messrs. Greenshields & Co., of Wellington, at a cost of £19,926. The work is to be completed in 14 months.

Rawtenstall.—At a recent meeting of the T.C., Ald. Coupe explained the increased cost of running the cars as being due to the fact that a large number of cars had been changed from regenerative to series-parallel control.

Southampton.—Motor-'Buses.—The Tramways Committee has deferred the question of purchasing 'buses for the present. The report of the deputation which inquired into the question favoured the Thornycroft and Tilling-Stevens vehicles.

South African Railway Electrification.—In his official report for the year 1913, Mr. W. W. Hoy, general manager of the railways, &c., discusses the proposed electrification of certain sections of the South African Railways, and emphasises the advantage that would arise from the electrification of the Wynberg line in the Cape Peninsula. He avers that as an engineering proposition, the electrification of certain sections of the railways in South Africa is not open to doubt, and that the points remaining to be considered are:—(*a*) Capital cost; (*b*) working expenditure; (*c*) choice of system; and (*d*) section of line to be electrified. Mr. Hoy suggests that the Administration should secure the most eminent advice obtainable, and that a consulting electrical engineer who is acquainted with the subject should visit South Africa and study the local problems and conditions on the spot and report.

TELEGRAPH and TELEPHONE NOTES.

Australia.—A test case has been decided with regard to the compensation payable by the Federal Government in respect of private telephone lines, of which the Postmaster-General has resumed possession. The payment was assessed by the arbitrator, Mr. A. B. Shand, at £60, and the Government was ordered to pay the costs of the reference and award.

German Telephones.—It is reported that the Russian military authorities are taking over the private telephones from Reval westwards and the lines to the neighbouring islands. These lines were originally put up by Germans, and the descendants of these concessionaires are under suspicion.—*Standard.*

Honolulu.—The Marconi Wireless Telegraph Co. states that the service to Honolulu has not been closed, as reported by the United States Government, and that the commercial service is being carried on as usual.

Telegrams in Code.—The Government proposes to allow the use of a limited number of authorised codes for telegraphic traffic between the United Kingdom on the one hand and countries outside Europe on the other. A further announcement will be made as to the date on which the concession will come into force, and the conditions under which it will be allowed.

Telephone Spy.—A correspondent of the *Daily Call* states that near Insterberg news has been leaking through to the Germans from an unknown source. There were no telegraph or telephone wires available, and the conclusion was arrived at that the Germans were using special subterranean cables installed prior to the outbreak of hostilities. In several instances this assumption was subsequently justified. In the village of Margraboff, the teacher of the local school was found to be using a telephone, which was placed in a hat-box lying on a heap of clothing in a wardrobe. From this hat-box the telephone wires went underground in the direction of the places where the German troops were stationed, and through the medium of these wires the teacher could establish communication with the Germans, and give them very useful information. When it was discovered that the teacher possessed a "telephonic exchange," the first thing done was to telephone to the Germans false news as to positions, strength, movements, &c. Then the wires were cut, and the owner of the telephone was brought before a court-martial, with the usual sequel.

Wireless Apparatus.—By an Order in Council issued last week, it is prescribed that no person shall, without the written permission of the Postmaster-General, buy, sell, or have in his possession or under his control any apparatus for the transmission of messages by wireless telegraphy, or any apparatus intended to be so used; nor shall he sell any such apparatus to any person who has not obtained such permission.

Wireless Apparatus Seized.—The police recently removed a wireless telegraph installation from the residence of Prof. Arthur Schuster, at Wargrave, in consequence of which the daily Press published particulars of the career of the owner, who is the Secretary of the Royal Society, and the brother of Sir Felix Schuster, governor of the Union of London and Smith's bank, and was formerly Professor of Physics at Manchester University. It is hardly necessary for us to say that to suspect Prof. Schuster of any act unfriendly to this country would be to court the ridicule of those who are acquainted with his record of honourable service to the nation. He installed the apparatus in June last under licence from the Postmaster-General, for the purpose of receiving the time signals from the Eiffel Tower, and when war was declared, in the absence of Prof. Schuster, the installation was dismantled by Post Office officials and packed up in a sealed box, which was removed on October 14th. Prof. Schuster's only son is an officer in the Yeomanry.

In a letter to the *Times* of October 19th, Sir Joseph Larmor, whilst emphasising the danger of secret wireless telegraphic communication, points out that it is almost impossible to prevent the unauthorised reception of wireless messages, but easy to detect the sending of messages; he approves of the surveillance even of Fellows of the Royal Society, but refers to the attack on its secretary as likely to make us appear ridiculous to neutral nations.

Wireless Charge.—On October 14th, Morgan A. Watzdorf pleaded guilty at the Central Criminal Court to a charge of establishing a wireless telegraphic apparatus at his home, in 1913, without a licence. Particulars of this and other charges have already been published in this column. It was stated that the prisoner, wishing to become a wireless operator on board ship, applied in 1912, 1913 and 1914 for a licence, but it was refused on the ground that he was under age. In August, as he had not complied with a notice to take the apparatus down, the Post Office removed it. Mr. Justice Rowlatt sentenced him to a fortnight's imprisonment in the second division, and ordered the apparatus to be forfeited, saying there was nothing to show that he contemplated being useful to the enemy.—*Times.*

Wireless Spying.—Letters in recent issues of the *Times* indicate the possibility of wireless transmission from an aerial wholly indoors to a station over 150 miles distant, and the possible use of a telephone wire as an aerial for the reception of wireless messages. It is also possible for telephone subscribers to communicate with one another telegraphically over a telephone line without the knowledge of the exchange operators.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Melbourne.—November 25th. Victorian Railways. 25 battery signal machines for operating signals. Contract 27,479. Contractors' Room, Railway Offices, Spencer Street.

December 2nd. Victorian Railways. 1,376 steel disk wheels complete for electric cars; steel disk wheel centres and steel tires for electric motor-cars; 1,376 steel disk wheels for electric motor-cars. Three separate contracts. Particulars from Contractors' Room, Railway Offices, Spencer Street.

December 9th. Victorian Railways. 110 tons of block tin. Contract 27,436. Contractors' Room, Spencer Street.

December 16th. Victorian Railways. Rubber-covered copper wire. Contract 27,705. Contractors' Room, Spencer Street.

December 16th. Victorian Railways. 100 neutral track relays for electrical circuits. Contract 27,712. Contractors' Room, Spencer Street.

December 28th. Victorian Railways. Three 50-kw. static transformers. Contract 27,727. Contractors' Room, Spencer Street.

Adelaide.—November 11th. Portable desiccating plant, petrol motor driven, for Postmaster-General. See "Official Notices" October 9th.

December 9th. Telephone instruments and parts, for the Postmaster-General. See "Official Notices" to-day.

Perth.—November 18th. 249 accumulators and power board, for Postmaster-General. See "Official Notices" October 16th.

Brisbane.—November 18th. Instruments and parts. See "Official Notices" October 9th.

December 15th. Switchboard, common battery, automatic or semi-automatic, for the Postmaster-General. See "Official Notices" October 9th.

Sydney.—December 9th. P.M.G. The time for tenders for various telegraph instruments and measuring instruments has been extended to December 9th.

November 23rd.—The City Council has extended the time for the receipt of tenders for wet air filters from October 26th to November 23rd.

December 21st. City Council. Motor-generators and switchgear suitable for electric vehicle battery charging. Specifications, 10s. 6d., from City Electrical Engineer.

Beckenham.—October 26th. U.D.C. Twelve months' supply of Midland small coal for the electricity works. See "Official Notices" October 16th.

Birmingham.—October 26th. Electric light installation, Western Road House and Dudley Road Infirmary, for the B. of G. Messrs. Edwards & Shaw, engineers, 105, Colmore Row, Birmingham (returnable deposit of £5).

Blackpool.—Corporation. 24 cast-iron distribution pillars, H.T. and L.T. cables, earthenware conduit. See "Official Notices" October 9th.

November 19th. Corporation. Water-tube boiler, mechanical stokers, economiser, steel chimney, cold-storage hopper, one 1,500-kw. turbo-alternator, surface condenser and auxiliaries. See "Official Notices" to-day.

Canary Islands.—Tenders have just been invited by the municipal authorities of Icod (Canary Islands) for the concession for the electric lighting of the town during a period of 21 years.

Cardiff.—October 26th. Wiring and fittings at the County Police Station, Canton, Cardiff, for the Standing Joint Committee of the Glamorgan Quarter Sessions and County Council. Specifications and form of tender from the County Hall.

Connah's Quay.—November 6th. U.D.C. (Contract 2) Gas engines, suction gas plant, pipework, cooling tank, dynamos, booster, switchboard, connections and storage battery. (3) Overhead and underground mains, services and public lighting. See "Official Notices" October 16th.

Dublin.—November 5th. G.N. Railway Co. (Ireland). Twelve months' supply of stores, including a number of electrical items. See "Official Notices" October 16th.

November 9th. Dublin United Tramways Co. Twelve months' supply of stores, including car fittings, electric supplies, &c. See "Official Notices" to-day.

Finchley.—October 26th. U.D.C. 1,000 tons of Warwickshire D.S. small nuts or peas, for the Electricity Works. Forms of tender from Mr. E. Calvert, Electrical Engineer, Squire's Lane.

The Education Secretary has been instructed to obtain special terms for the usual supplies of lamps.

Hawarden (Flint).—November 11th. R.D.C. Gas engines, suction gas plants and dynamos, switchboard, balancers and boosters, storage battery, underground mains. See "Official Notices" to-day.

Heywood.—Tenders are to be invited for converting plant in connection with the bulk supply scheme.

London.—October 28th. L.C.C. Installations, 160 wiring points, 200 lights, at Victoria School, Hammersmith; 126 wiring points, 170 lights, at Woolmore Street School, Poplar. See "Official Notices" October 9th.

October 27th. 20,245 yards of grooved trolley wire. Particulars to be obtained from Chief Offices, L.C.C. Tramways, 62, Finsbury Pavement, E.C.

November 4th. Installation, 235 wiring points, 290 lights, at Senior Street Elementary School, Paddington. See "Official Notices" to-day.

HAMMERSMITH.—November 4th. H.T. and L.T. underground electric supply cables, for the B.C. See "Official Notices" to-day.

New Zealand.—GISBORNE.—December 5th. Borough Council. Direct-current meters for electric lighting. (Deposit £25, to Town Clerk.) Specifications, &c., may be seen at Board of Trade Commercial Intelligence Department in London.

South Africa.—November 2nd. S.A. Railways Administration. 14,080 incandescent lamps and 39,150 train-lighting lamps—all tungsten drawn-wire. Secretary to Tender Board, S.A.R. Headquarters, Johannesburg; and S.A. High Commissioner in London, 32, Victoria Street, S.W.

Spain.—Tenders have just been invited for the concession for the working of the telephone exchange in the town of Valls (province of Tarragona) during a period of 20 years.

The Spanish Government Department has issued a new list of materials required by it, which may have to be obtained from abroad, and for which foreign competition will be admissible. This list includes: Metal-working machinery; wood-working machinery; leather cutting and stamping machinery; constructional material for air service; high-tension and special steel of all kinds, in bars, sheets, &c.; steel boiler plates; dynamos and accessories for the lighting of railway carriages. Some further information may be seen at the Commercial Intelligence Branch of the Board of Trade.

November 12th. The municipal authorities of Talvera de la Reina are inviting tenders for the concession for the electric lighting of the town during a period of four years.

Swinton.—The Lighting Committee is to purchase a tower ladder for use in connection with the electric street lighting, at £22. It has also been decided to purchase 300 electric lamps of 50 C.P., and 100 of 100 C.P. for the lighting of the tramway route.

Tunbridge Wells.—November 7th. Corporation. 12 months' supply of H.T. and L.T. cables. See "Official Notices" October 9th.

York.—October 23rd. North-Eastern Railway. Twelve or six months' supply of telegraph apparatus, telegraph wire and line stores. See "Official Notices" October 16th.

October 23rd. North-Eastern Railway Co. Six or twelve months' supply of arc lamp carbons, wires and cables, electric light fittings, arc lamp globes, &c. Forms of tender from Mr. E. H. Clark, Stores Superintendent, Gateshead.

November 9th. Construction of about 1½ miles of light railway, excluding overhead electrical equipment, for the T.C. Mr. F. W. Spurr, City Engineer (returnable deposit of £5).

Wakefield.—December 4th. Yorkshire (W.R.) Electric Tramways Co., Ltd. Twelve months' supply of electric lamps, fittings, insulating materials, &c. Schedules can be obtained from the Central Offices, Belle Isle, after November 9th.

CLOSED.

Australia.—The following tenders have been accepted:

P.M.G.'s Department, Victoria:—
1,250 earth plates, £455.—J. Bartram & Son.
30,000 dry cells, 3 by 3, £2,937; 250 dry cells, Obach, £18 15s.—A. J. Sage and Co.
P.M.G.'s Department, South Australia:—
20 tons of H.D. copper wire, £1,514; 20 tons of bronze wire, £1,787.—British Insulated & Helsby Cables, Ltd.
N.S.W. Public Works Department:—
Two 5-H.P. motors.—Australian G.E. Co.
Low-tension switchboard at abattoirs, £1,158.—Australian G.E. Co.
Queensland Public Works Department:—
Electric goods lift at Brisbane, £276.—Norman Bell & Co.
P.M.G.'s Department, Sydney:—
Installation of electrically-controlled clocks at Newcastle, N.S.W., £89.—W. G. Watson & Co.
—*Tenders.*

Brighton.—The Guardians have accepted the tender of Mr. H. J. Galliers, at £150, for electrical supplies for the next three months.

Chesterfield.—The Corporation Electricity Committee has decided to obtain a 1,500-KW. rotary converter and transformer, with the necessary controlling switchgear, at a cost of £2,200, and a 1,200-KW. transformer and switchgear, at a cost of £282, both from the British Westinghouse Electric and Manufacturing Co., Ltd. A high-tension cable, at £725 approximate, is to be ordered from the B.I. and Helsby Cables, Ltd.

Glasgow.—The T.C. Electricity Committee has accepted the following tenders:—

Babcock & Wilcox, Ltd.—Coal-conveying plant at the new generating station to be erected at Dalmarnock, £22,234.
The Edison Battery Co.—Providing three electrical vehicles at a cumulative price of £2,446.

The Committee on Tramways, Works and Stores recommends the acceptance of the offer of Messrs. James Thompson & Son for the supply of vulcanising plant and a lathe for a garage.

Government Contracts.—The following tenders have been accepted during the past month by the following Government Departments:—

H.M. OFFICE OF WORKS.

Extension of electric wiring at public offices, Westminster.—The Alpha Manufacturing Co.
Incandescent electric lamps (supply for one year).—British Drawn Wire Lamp Co., Ltd.; British Thomson-Houston Co., Ltd.; Edison & Swan U.E.L. Co., Ltd.; Siemens Bros. Dynamo Works, Ltd.

POST OFFICE.

Cables, Canterbury-Dumpton Gap.—Johnson & Phillips.
Power cables, Fordrough Lane Factory, Birmingham.—W. T. Henley's Telegraph Works Co., Ltd.
Laying lines of self-aligning ducts.—London-Chelmsford-Colchester: Section II, W. Dobson; Section III, R. J. May. London-Sevenoaks: Sections II and IV, G. J. Anderson; Section I, W. Iles. Birmingham-Sheffield: Section V, H. Ashby; Sections VI and VII, Callender's Cable and Construction Co., Ltd.; Section II, W. Dobson; Section IV, Bower Bros. London Road-Bromley section: W. Griffiths & Co., Ltd. Southport-Ormskirk section: W. Pollett & Co., Ltd. Edinburgh-Forth Bridge section: Casey & Darragh. Glasgow-Kilmarnock section: J. & D. Meek, Ltd.
Telephone exchange equipment—Whitehaven: Peel-Conner Telephone Works. Woking: Automatic Telephone Mfg. Co. Dover: Western Electric Co. Belfast (extension): Western Electric Co.
Protective apparatus.—British L. M. Ericsson Mfg. Co., Ltd.
Telephonic apparatus.—British L. M. Ericsson Mfg. Co., Ltd.; General Electric Co., Ltd.; Western Electric Co.
Electric light cables.—India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.
Submarine cables.—W. T. Henley's Telegraph Works Co., Ltd.; L.-R., G.-P. & Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Siemens Bros. & Co., Ltd.; Telegraph Construction & Maintenance Co., Ltd.
Telephone cable.—Callender's Cable & Construction Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; London Electric Wire Co. & Smiths, Ltd.
Arc lamp carbons.—General Electric Co., Ltd.
Dessicators.—Lacy, Hulbert & Co.
Joint-box guards.—W. Rogers & Sons.
Insulators.—Taylor, Tunnicliff & Co., Ltd.
Ironwork.—Bullers, Ltd.; Highfield Foundry Co., Ltd.
Protectors.—A. C. Jeffrey; E. Sellers & Son.
Felt rings.—Bullers, Ltd.
Solder.—E. Austin & Sons.
Insulator spindles.—T. W. Lench, Ltd.
Steel tubes.—Stewart & Lloyds, Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.
Galvanised-iron wire.—Johnson & Nephew, Ltd.; Rylands Bros., Ltd.; F. Smith & Co., Wire Manufacturers, Ltd.
Vulcanised wire.—C. Macintosh & Co., Ltd.

CROWN AGENTS FOR THE COLONIES.

Single-phase alternators.—British Westinghouse Elec. & Mfg. Co., Ltd.
Telephone cable.—Western Electric Co., Ltd.
Motor and starter.—British Thomson-Houston Co., Ltd.
Light tramway.—Montania Engineering Co., Ltd.

INDIA OFFICE STORE DEPARTMENT.

Accumulators.—Tudor Accumulator Co.
Cable.—T. Bolton & Sons, Ltd.
Converters.—Lancashire Dynamo & Motor Co., Ltd.
Dynamo parts.—J. Stone & Co., Ltd.
Engines.—Lancashire Dynamo & Motor Co., Ltd.
Instruments, &c.—Siemens Bros. & Co., Ltd.
Motors.—Lancashire Dynamo & Motor Co., Ltd.; Laurence, Scott & Co.
Wire.—British Insulated & Helsby Cables, Ltd.; Elliott's Metal Co.; Shropshire Iron Co.; R. Johnson & Nephew.

Hornsey.—The B.C. has accepted the tender of the Western Electric Co for cable.

London.—LEWISHAM.—The B.C. Libraries Committee has accepted the tender of Messrs. Haycraft & Son, Ltd., at £51, for the installation of electric light at the Brockley Branch Library, which is now lighted by gas.

L.C.C.—The Fire Brigade Committee recommends that the tender of Messrs. Mossay & Co., Ltd., for the supply of an electrically-driven chassis to carry a turntable ladder, be cancelled, as the company proposed sub-letting to the Hansa Lloyd Works A.G., of Bremen, the construction of the chassis (without batteries), and in consequence of the war this cannot be carried into effect.

The Committee reports the acceptance of the tender of Messrs. W. A. Stevens, Ltd., for two petrol-electric chassis to carry Magirus ladders, at £762 each.

The Alpha Manufacturing Co., of Balham, has received the contract for electric light and power wiring, &c., for the extension of Government offices at Westminster, for H.M. Office of Works, and that for the electric lighting of the Vernon Square Elementary School, Finsbury, for the L.C.C.

Malvern.—The U.D.C. has accepted the tender of the South Wales and Cannock Chase Coal and Coke Co. for a year's supply of coal to the electricity works.

Rugby.—The Joint Hospital Board has received the following tenders for the electric light installation at Harborough Magna Hospital:—

Mr. S. P. Marsh, Rugby	(accepted)	£250
Rawlings Bros., London		250
Linnell & Son, Rugby		271
Burberry & Co., Coventry		293

The tender of Mr. Denyer, Brinklow, for the erection of the electric light engine-house and the water supply tank, at £199, has also been accepted.

Southampton.—The Education Committee has received the following tenders for the installation of electric light at the Foundry Lane School:—

H. M. Ashton, Ltd.	(accepted) £195	F. W. Cook & Co.	£267
H. C. Taplin & Sons	197	W. Dibben & Sons	277
E. D. Wishart & Co.	224	A. E. Wells & Co.	296
Geo. Vivian & Sons	235	A. Burkett	337
I. Groves & Co.	239	A. Smethurst & Co.	321
Proctor & Jarrard	260	A. Kingman & Co.	Informal

Stockport.—The Board of Guardians has accepted the tender of Mr. Richard Bardsley for "Mazda" metallic-filament lamps.

FORTHCOMING EVENTS.

Physical Society of London.—Friday, October 23rd. At Imperial College of Science, South Kensington. Presidential address on "Ionization," by Sir J. J. Thomson, F.R.S.

Greenock Electrical Society.—Thursday, October 29th. At 7.45 p.m. At 21, West Stewart Street. Paper on "The Manufacture of Electric Cables," by Mr. R. A. D. Macalister.

Institution of Electrical Engineers.—Thursday, October 29th. At 8 p.m. At Victoria Embankment, W.C. Inaugural address by the President.

Institution of Mechanical Engineers.—Friday, October 30th. At 8 p.m. At Storey's Gate, S.W. "Thomas Hawksley" Lecture.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, October 30th. At 7.30 p.m. At Bolbec Hall, Newcastle upon-Tyne. General meeting.

'Graduates' Section).—Saturday, October 31st. At 7.15 p.m. At Bolbec Hall. Address by Mr. E. L. Champness.

Institution of Municipal Engineers.—Saturday, October 31st. Eastern and North-Eastern District meeting, Lincoln. At 11.45 a.m. At Guildhall. Business meeting; luncheon. Afterwards visits to various undertakings, including, at 2.45 p.m., electricity works and tramway undertaking.

NOTES.

Royal Mint Report.—The Deputy Master, Sir Thomas Elliott, in his Annual Report states that during 1913 over 185 million coins were produced, this figure being upwards of 14 million more than in 1912, the previous highest total. Of this number 150 million were for Imperial issues and 35 million for Colonial requirements. The Imperial coinage was made up of 30½ million gold, 32½ million silver, and 87 million bronze pieces. The bronze figure exceeded that of the previous year by 10 million, and is the highest on record. The year's operations resulted in a net profit of £870,945, as against £1,243,576 in 1912, the decrease being due, principally, to the reduced demand for silver coin during the period under review.

The memorandum of Mr. Rigg, Superintendent of the Operative Department, shows that in 1913 nickel bronze bars were melted for the first time since the adoption of coal gas furnaces in the melting houses (see ELEC. REV., November 12th, 1912, p. 704, and October 24th, 1913, p. 666). And this has made possible a more complete comparison as to the cost of melting under the original coke-fired furnaces and the gas system which has replaced them. The melting costs (fuel, crucibles and wages) per ton of bars in 1909—the last year entirely under the old *régime*—was 82'06s., and the corresponding figure for 1913, 59'62s.

During the year changes in the power and lighting plant of the Mint were of a minor character. The number of motors in use has risen from 99 to 102, and their gross H.P. from 834¾ to 877. High candle-power incandescent lamps have replaced arc lamps in the cutting and weighing rooms, and the total number of arc, flame and silica lamps is now 64, as compared with 71 in 1912. In official premises the number of incandescent lamps has risen from 995 to 1,151, whilst in private residences there are 121—89 less than in 1912—the decrease being due to the vacation of No. 1 residence. The average monthly output of the Mint generators was 34,302 B. of T. units—an increase of 4,241 over the previous year's average.

In the Inland Revenue Department, in connection with the preparation of postage-stamp plates and dies for post-cards and wrappers, 1 copper, 137 nickel, and 186 steel-faced electros were grown. In this department, also, at the request of the Department of Ancient Monuments and Historic Buildings, a series of electrotypes of the inscriptions on the walls and in the cells of the Tower of London was made. They number 268 in all, and vary from 3¼ in. × 3¼ in. in size, to one very long one measuring 35 in. × 24 in. Master-plates have been secured from all the moulds, and it is intended to deposit two replicas from each mould.

A new feature of the present Mint Report is the inclusion of memoranda by the superintendents and assayers of the Branch Mints, in addition to the usual reports of the deputy masters.

In the memorandum of Mr. A. Ventris, superintendent at the Perth branch, reference is made to the recently installed Root's blower, coupled direct to a 20-H.P. motor, which provides the air pressure of 1¾ lb. required for the new group of 13 gas furnace burners, and for the 17 remaining furnaces in which coke fuel is used. In this branch also a 30-H.P. motor-driven breaking down mill, with 14-in. rolls (erected in 1911), has considerably expedited the operation of rolling.

In the Canadian Branch Mint at Ottawa, Mr. Cleave, the superintendent, states that a Hoskins electric furnace has been installed for the heat treatment of dies, collars, &c. It is operated from the ordinary power circuit at 220 volts D.C., the consumption being 4 units per hour. As the price per unit for power is 2 cents, the cost of the electricity supply for the furnace is 8 cents per hour. The temperature is regulated by a multi-step circular rheostat, the full current being used to heat up from cold and the necessary resistance thrown in when the pyrometer shows that the required temperature has been reached. The furnace has been in constant use since April, 1913, and is still as efficient as when first installed. The heating element has a guaranteed life of 1,000 hours, provided the temperature is not raised above 1,800° F. In connection with the hardening and annealing furnace, a small electric testing furnace has been set up. Sample pieces from the different makes of steel used are heated in this, and in each case the decalescent and recalescent points are observed. In this way when treating steel of uncertain composition the danger of overheating is obviated.

In the assay office at this branch also experiments have been carried out during 1913 by the assessor, Mr. Pearson, and the assistant-assessor, Mr. Entwistle, on electrolytic refining, to determine the effect of (1) substituting silver strips and hooks for those of gold, and (2) of dispensing with the heating of the electrolyte. It was found that the silver strips and hooks became rapidly covered with an exceedingly thin coating of silver chloride, which increases the internal resistance. This drawback may perhaps be overcome if they are plated with gold. The silver hooks have one advantage over gold in that, if they accidentally dip into the electrolyte, they do not dissolve, whereas gold hooks under the same conditions dissolve in a few moments.

It was found also that with the hot electrolyte the fineness of the gold deposited was 998'9 at the highest and 998 3 at the lowest; with the cold electrolyte the corresponding figures were 998'2 and 996'8, the greater part of the balance being silver in each case. The gold from the hot cell (998'3) contained 1'5 silver per 1,000, and that from the cold cell (996'8) 2'5 per 1,000. In addition, gold from the hot electrolyte contained a distinct trace of lead (less than 0'1 per 1,000), traces of copper, iron, arsenic and distinct traces of platinum. That from the cold electrolyte had no trace of lead, but traces of copper, iron and nickel, and a distinct trace of platinum, though less than that from the hot liquid. Analysis was made also of the slime from each type of cell.

Another series of experiments was carried out during the year to determine the rate of production and cost of electrolytic gold chloride from impure gold anodes containing 92'2 per cent gold, 6'6 per cent. silver, and 1'2 per cent. base (chiefly lead). An average current of 83'4 amperes, at 2 41 volts per cell, will give, with two cells, 40 litres of acid gold chloride containing 393 oz. of gold in solution in 34 hours. The mean cost for power (with generator set having an efficiency of only 33 per cent.) was 0'23 cent. per oz. of gold in solution, or 0'979 cent. per oz. including acid.

Fatalities.—On Friday a boy, aged six years, named Harold Ashcroft (son of a Reservist at the Front) was killed on the Lancashire and Yorkshire Railway at Aintree, while trespassing on the railway line, where he was found insensible on the live rail. He was taken to hospital, but death had taken place almost immediately.

At Sheffield on Saturday an inquest was held on the body of James Brinnen, commercial clerk, of Sheffield, who had dropped dead on the previous day at the Electric Light Generating Station Club, Neepsend, Sheffield, while standing near his desk. Verdict: "Death from heart failure."

Private David Cameron, of the 3rd Northumberland Fusiliers, was killed on the 14th inst. on the North-Eastern Railway, at Backworth, near Newcastle-on-Tyne. He was crossing the line when he stepped on a live electric rail.

Electricity in Toxicology.—It is reported from New York that by being placed in an electric oven at a temperature of 250° to 300°, David R. Beach, a broker, was cured of accidental poisoning by bichloride of mercury.

London County Council and Electrical Trades List of Rates of Wages and Hours of Labour.—The General Purposes Committee, on Tuesday last, submitted the following revised list of rates of wages and hours of labour paid and observed by the Council in accordance with its standing orders in works of construction, repair or maintenance of buildings or electrical engineering work, which the Council may resolve to carry out without the intervention of a contractor within a radius of 20 miles from Charing Cross. Contractors for works in the nature of construction, repair, &c., to be executed within a radius of 20 miles from Charing Cross, or on a site partly within and partly outside the radius, are required to pay wages at rates not less, and to observe hours of labour not greater, than the rates and hours set out in this list.

* Wiremen	9½d. per hour.
Jointers...	9d. "
Labourers	6½d. "
Armature winders	9½d. "
Armature winder helpers or labourers ...	6½d. "
Transformer winders	8d. "
Magnet winders	7d. "

Fifty-four hours per week. Overtime:—First 2 hours, time and a quarter; second 2 hours, time and a half; after 4 hours until starting time next day, double time.

Plumber jointers	1s. per hour.

Fifty-six hours per week. Overtime:—First 2 hours, time and a quarter; second 2 hours, time and a half; after 4 hours until starting time next day and Sundays, double time.

Electric derrick drivers	10½d. per hour.
Drivers of (electric) travelling cranes and overhead travellers	9d. "

Hours and rates for overtime as arranged.

* Electrical wiremen when employed with the building trades or on buildings are, in accordance with the agreement of August, 1914, between the Electrical Trades Union and the London Electrical Masters' Association, to be paid 10½d. an hour, the hours of labour, &c., also to be in accordance with that agreement.

Late Correspondence.—The following letters have come to hand just as we go to press :—

CARBONS.

"Some few weeks ago, letters appeared in your columns making inquiries as to whether all the carbons sold by the General Electric Co., Ltd., were of English manufacture, and in due course a reply appeared from the secretary of that company. He stated that if one of two conditions were complied with, he was empowered by his directors to answer the various points raised by your correspondent.

"I am in a position to assure the secretary of the General Electric Co., Ltd., that the questions raised are of the greatest interest to numerous readers of your journal, from the lowly contractor to the mighty consultant, and further, the very fact that your correspondent's questions have been evaded, has stimulated a still greater interest in the electrical trade. In view of the General Electric Co.'s manifesto concerning the carbon industry which appeared in your columns, I claim that the trade has a right to insist that the two letters on this subject be freely answered.

"IN TENEBRIS."

[We think that our anonymous correspondent has overlooked the fact that the firm named offered to answer the questions put by "Inquirer," if he would make his name public instead of hiding behind a *nom de plume*.—EDS. ELEC. REV.]

WHO CAN HELP?

"Will any of your readers, who may be in a position to do so, offer to assist a young Belgian who has been compelled to quit his own country and is desirous of obtaining temporary employment of any kind in England?

"I have been asked by the Belgian Consul in Dover to do anything I can for him, but, unfortunately, I cannot employ him here. He is apparently well educated, of good presence, and is training for central station duties, but speaks very little English. Possibly, however, his knowledge of French may prove useful to many. I shall be pleased to put him into communication with anyone who may be able to help him.

"L. W. WOODMAN,
"*Borough Electrical Engineer.*

"Electricity Works, Dover.
"*October 21st*, 1914."

Lead Poisoning.—In the course of a lecture on "The Industrial Diseases of Greater Manchester," delivered at the Manchester University on October 8th, Dr. L. S. Reynolds (Professor of Clinical Medicine), said that lead poisoning was by far the commonest and most serious of all the industrial diseases of the district. The number of occupations in which lead poisoning might occur was very great, and included makers of electrical appliances, especially accumulators.

Three facts about lead poisoning were worthy of mention. The first was that extremely small doses, frequently repeated, were sufficient to produce symptoms—for instance, as little as one-hundredth part of a grain per gallon in drinking water. The second was that, as in the case of alcohol, young people were very susceptible to the poison. And the third fact was that when a person came in contact with lead at all, the smaller the quantity handled the greater were the chances of poisoning. The last point was important. A person working in a trade well known as liable to cause lead poisoning was educated to take precautions. On the other hand, a fitter of steel machinery, for instance, was never warned of the danger. He was supposed to be working only with steel. As a matter of fact, nearly every fitter used red lead for various purposes, yet he was seldom careful to wash his hands after using it.

Institution and Lecture Notes. — INSTITUTE OF MARINE ENGINEERS.—At a meeting on October 12th, a paper by Mr. E. Kilburn Scott, on "Gyroscopic Compasses, with particular reference to the 'Sea Star' type," was discussed. After briefly describing the Anschutz and Sperry compasses, the author said that the errors peculiar to these compasses, for which allowances had to be made, were those due to latitude, change of latitude at constant speed, change of speed, rolling and pitching, slowness of gyroscope and those produced by steering. These errors, he said, could be traced to one feature which both the compasses had in common, viz., that they were pendular; that was to say, they depended upon the force of gravity to be effective.

The "Sea Star" type, designed by Capt. V. H. Rozic and the author, is so arranged that the righting momentum does not depend on gravity for its magnitude, but is always determined by the amount of deflecting momentum that has to be counteracted. The means to this end are forcible and automatic. Another feature is that the gyro-wheel is so mounted that it is non-pendular about its horizontal axis, and therefore is not subject to ballistic effects. One object in view is to dispense with correction tables and mechanical correctors; another, to devise an instrument that could be made small and cheaply so as to be of use on merchant vessels, aeroplanes, &c. The "Sea Star" differs from the Anschutz and Sperry types in that the direction of rotation of the gyro-wheel is clockwise when looking at the north-pointing end of the gyro-wheel spindle. The other two run counter-clockwise. Owing to the direction of rotation of the "Sea Star" gyro-wheel being opposite to the rotation of the earth, the gyro-wheel is in a state of permanent unstable equilibrium and, therefore, as soon as it has been deflected in the slightest degree, there is a strong tendency to increase the deviation and the motor is immediately started to correct it. There is thus a very great sensitiveness when in the meridian, and this sensitiveness allows the "Sea Star" type to be built in small sizes, for the kinetic energy of the wheel is of lesser importance than with other compasses.

THE INSTITUTION OF ELECTRICAL ENGINEERS.—The programme for the Session now commencing includes :—

1914.—October 29th.—Inaugural Address by the President (Sir John Snell).
November 12th.—"Cables." By Mr. C. J. Beaver.
" 26th.—"Power Plant Testing." By Mr. W. M. Selvey.
December 10th.—"Automatic Switchgear for Alternating-Current Systems." By Mr. E. B. Wedmore.
1915.—January 14th.—"The Shape of the Pressure Wave in Electrical Machinery." By Dr. S. P. Smith and Mr. R. S. H. Boulding.
" 28th.—The Sixth Kelvin Lecture: "Lord Kelvin's Work on Gyrostatics." By Prof. A. Gray, F.R.S.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS.—The opening meeting of the West of Scotland Branch was held on Saturday evening at Glasgow. Mr. A. B. Muirhead, Lenzie, the new President, delivered his presidential address, in the course of which he dealt with the things that mattered in the maintenance and repair of electrical plant, and the regulations for the use of electricity in mines. He said that colliery electrical plant required very different treatment in its maintenance and repair from that which was customary in the case of mechanical plant. It had been said that mechanical plant cost little to maintain, whereas the maintenance of electrical plant was a serious item; investigation, however, often revealed the fact that the basis of comparison was unsound. Hitherto it had been the custom to carry on ordinary mechanical repairs at the colliery, and it was amazing how little was known of the actual cost of this work for time and material. The outlays appeared in a general way against the colliery stores and colliery wages bill. On the other hand, an electrical repair was sent out to the manufacturer, and his bill passed through the office and attracted notice because it was a concrete item. Moreover, the singling out of the cost of repairs on electrical plant ignored the greater economy and higher efficiency of electrically-operated plant. If they looked back on the state of the industry as it existed prior to 1904, and took into consideration the enormous development in the use of electricity since that year, they were compelled to acknowledge the high standard of engineering shown in the modern plant as specified, to some extent, in the regulations.

In the course of the proceedings, prizes were presented to Mr. J. P. C. Kivlen, United Collieries, and Mr. J. A. Kerr, now in South Africa, for papers read by them, and it was announced that this session special prizes would be presented to working colliery electricians for practical contributions.

GREENOCK ELECTRICAL SOCIETY.—On October 18th Mr. J. H. Parker read a paper on "Alternating Current."

WIRELESS IN WARFARE.—A free public introductory lecture was given at University College, London, on October 14th by Prof. J. A. Fleming, on "Wireless Telegraphy in War."

Electrical Business Openings Abroad.—Some fuller information respecting the following matters will be found in the current issue of the Board of Trade *Journal* :—

Spain.—A Cadiz firm wants names and addresses of British manufacturers of metal-filament lamps, electric light fittings, and other electric light material. Large imports from Germany hitherto. Firms should communicate direct with British Vice-Consulate, Cadiz.

Italy.—A Milan firm desires to get into touch with British manufacturers of iron stampings for laminations, electric lamps, arc lamp carbons, and carbon brushes. An agent wishes to represent British manufacturers of electrical material. In both cases write to British Consulate, Milan.

France. — Manufacturers of British electric hand-drilling machines are asked for by the British Chamber of Commerce in Paris.

Canada.—A Montreal agent wants to represent British manufacturers of insulating material and general electrical specialities, particularly cast-iron street-lighting standards. H.M. Trade Commissioner for Canada, 3, Beaver Hill Square, Montreal.

South Africa.—English agent formerly representing prominent German competitor in South African electrical trade wants to communicate with British makers of electrical machinery and supplies who are not already represented there. H.M. Trade Commissioner for South Africa, P.O. Box 1,346, Cape Town.

Royal Engineers Old Comrades' Association.—This Association was formed in 1912 to foster *esprit de corps* amongst all ranks, serving and retired, of the Royal Engineers, to promote recruiting, and to assist deserving members on leaving the corps to obtain employment, besides relieving necessitous cases. Full particulars can be obtained from the secretary, Mr. J. McB. Robbins, Horse Guards, Whitehall, S.W. The Association numbers 6,000 subscribing members, and in 12 months has found permanent employment for 200 ex-Royal Engineers.

Appointments Vacant.—Skilled mechanic (£2), for Salford electricity department; assistant electrical engineer (temporary, during war), 35s., for Fareham U.D.C.; charge engineer (35s.), for Wakefield electricity department; two junior assistants (£1), also jointer, for Kilmarnock Electricity Department. Particulars are given in our advertisement pages.

Inquiries.—Makers of pocket lamp batteries marked "British-made T.E.C.," and "Argentana" wire, are asked for.

Metropolitan Association of Electric Tramway Managers.—A meeting of the members of this Association was held on Friday last at the Municipal and County Club, Whitehall Court, Whitehall, S.W., when the following were present:—Messrs. Ullman (East Ham), chairman; Schofield (Leyton), vice-chairman; Bruce (L.C.C.), Coveney (Erith), Harvey (Ilford), Moffet (West Ham), Goodyer (Croydon), hon. secretary; Mason (South Metropolitan), Mackinnon (London United), Hammond (Metropolitan Electric), Birkett (Southend-on-Sea), and C. Mittelhausen. Letters stating inability to attend were received from Messrs. Fell (L.C.C.), Stokes (Bexley), and Murray (Walthamstow). Messrs. Ullman and Schofield were re-elected chairman and vice-chairman respectively, and Mr. Goodyer was re-elected hon. secretary. Various matters of interest were discussed.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—At St. James's Church, Ashton-under-Lyne, on October 14th, the marriage took place of MR. S. E. B. BUCKLEY, mains superintendent to the Stalybridge, Hyde, Dukinfield and Mossley Joint Tramways and Electricity Board, to Miss Annie Hampson, of Ashton. The presents included a canteen of cutlery from the generating station staff at Stalybridge.

The marriage took place at Tewkesbury Abbey on October 12th of MR. JOHN ATKINS, manager of the Ledbury electricity works, and Miss Ethel Mallett, only daughter of Mr. Alfred Mallett, of Tewkesbury.

MR. GILLITT, works superintendent, has been appointed to take charge of the E.L. station of Whitehaven T.C. during the absence of the electrical engineer, who has been attached to the Royal Naval Division for active service, at a salary of £3 10s. per week. The Council will keep open the engineer's position, and maintain his salary, having regard to his remuneration from the Government.

MR. G. H. BROWNE, Chief Assistant Engineer and Deputy Manager of the Ilkeston Corporation Tramways and Electricity Department, has been appointed engineer and manager (*pro. tem.*) during the absence of Mr. L. C. F. Bellamy with the Royal Naval Division, his salary being raised to £170 per annum.

General.—MR. H. HAYES has resigned his position with the Leigh Corporation electricity department, and has entered the business of his brother, Mr. Frank Hayes, tramways and public works contractor, at 68, Victoria Street, Liverpool.

MR. W. H. BLYTHE, of Plane Street, Bacup, who has been employed by Messrs. Ferranti, of Hollinwood, has taken up a new appointment at the British Westinghouse Works, Trafford Park. He has also been appointed evening assistant to the head of the electrical engineering department at the Manchester School of Technology.

COUNCILLOR W. M. WIGGINS, chairman of the Middleton Electricity Committee, has accepted the Mayoralty of the borough for 1914-15.

NEW COMPANIES REGISTERED.

W. Sanders & Co., Ltd. (138,005).—This company was registered on October 17th, with a capital of £1,000 in £1 shares, to carry on the business of electricians, mechanical engineers and manufacturers, workers and dealers in electricity, motive power and light, &c. The subscribers (with one share each) are:—W. Sanders, 63, Fernley Road, Sparkhill, Birmingham, manufacturer; H. Butcher, Ashurst, Rosemary Hill Road, Streetley, Staffs., merchant. Private company. The number of directors is not to be less than two or more than five; the first are W. Sanders and H. Butcher; qualification, 50 shares. Registered office, 7, Oxford Street, Birmingham.

Stanley J. Watson Magneto Co., Ltd. (137,973).—This company was registered on October 14th, with a capital of £100 in £1 shares, to carry on in the United Kingdom or elsewhere the business of agents for, dealers in, and manufacturers of magnetos and electrical and other appliances used in connection with engines, machines and motors, &c. The subscribers are:—S. J. Watson, 1, Marchmont Gardens, Richmond, Surrey, electrical engineer, 15 shares; F. J. Young, 2, Clare Street, Bristol, insurance broker, 10 shares. Private company. The number of directors is not to be less than two or more than five; the first are S. J. Watson (permanent) and F. J. Young; qualification, 50 shares; remuneration as fixed by the company. Registered office, 43, Berners Street, W.

Small Electric Motors, Ltd. (138,006).—This company was registered on October 17th, with a capital of £10,000 in £1 shares (7,500 preference), to take over as a going concern, and carry on, a branch of the business recently carried on by F. W. Potter & Co., of Phipp Street, Great Eastern Street, E.C., so far as regards the manufacture of electric motors, to carry on the business of general, electrical, mechanical and chemical engineers, makers of and dealers in electric motors, generators and transformers, commutators, shafts and spindles, slip-rings, bush-gear, magnet cases, burners, armatures, motors, magnetos, resistances, &c., and to adopt an agreement with H. P. Meares. The subscribers are:—F. E. Adams, 43, Boston Avenue, Southend-on-Sea, director, 100 shares; A. E. Newbould, 199, Piccadilly, W., director, 1 share; H. F. Joseph, Phipp Street Works, Shoreditch, E.C., electrical engineer, 1 share; W. H. Harris, 38, Bloomsbury Square, W.C., solicitor, 1 share; G. H. McNeil, 74, Harvist Road, Kilburn, N.W., accountant, 1 share; F. Stretton, 147, Nelson Road, Hornsey, N., clerk, 1 share; W. Berner, 58, Wrentham Avenue, Brondesborough Park, N.W., shorthand writer, 1 share. Minimum cash subscription, 1,000 shares. The number of directors is not to be less than three or more than seven; the first are F. E. Adams, R. Grierson, H. F. Joel, jun., and Capt. H. P. Meares. qualification, £100; remuneration, £50 each per annum. Solicitors, Ford, Lloyd & Co., 38, Bloomsbury Square, W.C.

British Bachelet Flying Train Syndicate, Ltd. (137,939).—This company was registered on October 12th, with a capital of £10,000 in 1s. shares, to enter into an agreement with C. Vane, and to carry on the business of proprietors and builders of railways, tramways and rolling stock, mechanical manufacturers and suppliers of balloons, flying machines and other contrivances for aerial navigation, electrical and general engineers, electricians, &c. The subscribers (with 50 shares each) are:—H. G. Clark, 53, Oaklands Road, Hanwell, W., clerk; E. W. Church, 35, Durlston Road, Upper Clapton, N.E. Private company. The number of directors is not to be less than two or more than seven; the subscribers are to appoint the first: remuneration, 10 per cent. of the net profits available for distribution, divisible. Registered office, 166, Piccadilly, W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Stratford-on-Avon Electricity Co., Ltd.—Particulars of £3,000 second debentures, created April 21st, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Electro-Flex Steel Co., Ltd.—Particulars of £15,000 first debentures, created September 29th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £7,500. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Manaos Tramways and Light Co., Ltd. (101,081).—Capital, £300,000 in £1 shares. Return dated September 9th, 1914. All shares taken up. £100 paid. £299,900 considered as paid. Mortgages and charges: £296,300.

Foote & Milne, Ltd.—Mortgage dated October 9th, 1914, to secure £10,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: London County and Westminster Bank, Ltd., 41, Lothbury, E.C.

CITY NOTES.

British Electric Traction Co., Ltd.

THE following circular has been issued, under date October 15th, to the preference and ordinary stockholders and the holders of income certificates:—

PROPOSED SCHEME OF REDUCTION OF CAPITAL.

With the letter from the chairman, which was addressed to the stockholders on July 2nd last, a form of question and reply was sent, and stockholders were asked to state before October 1st whether or not they were in favour of the directors' proposals.

I am now directed to inform you that 1,589 replies were received before August 4th last, and 318 have been received since.

The replies show that a large majority of each class of stockholder, and of the income certificate holders, who have expressed their views are in favour of the scheme. The directors are of opinion that but for the intervening state of war a much larger number of replies would have been received, which probably would have increased the majority in favour of their proposals.

Under the existing conditions, however, the directors consider that the wisest course is to defer any further action in regard to the scheme for the present.

THOMAS BOWER, *Acting Secretary.*

Ferranti, Ltd.

THE directors report that for the year ended June 30th, 1914, the profit on trading was £47,257, and, after crediting discounts, interest, and transfer fees, and deducting general establishment charges, repairs and renewals, legal expenses, income-tax, bad debts, directors' and trustees' fees, there remains a balance of £19,776. Interest on first mortgage debenture stocks absorbs £4,700; interest on five-year notes, £2,052; interest on bank loans, £1,426; and there is put to depreciation reserve account £10,000, leaving £1,598 plus £452 brought forward, making £2,050, which is to be carried forward. The results for the year show a falling off as compared with the previous year, but this is due in a considerable measure to the discontinuance of large switchgear work and the building up of new business in switchgear details. There has also been a falling off in export business due to monetary conditions ruling in certain countries. During the year £6,000 first mortgage debentures have been redeemed, and the loans against five-year notes and second mortgage debentures have been reduced. The directors refer to the great loss sustained by the company through the death of Mr. A. Bruce Anderson, managing director.

Montreal Light, Heat and Power Co.—The directors have declared a dividend of 2½ per cent. on the paid-up capital stock, being at the rate of 10 per cent. per annum, for the quarter ended October 31st.

Parsons Marine Steam Turbine Co., Ltd.—The report for the year to June 30th last states that during the past year the works were fully occupied in the construction of machinery for war and mercantile marine vessels, and the orders on hand will keep them fully employed during the current year. The directors recommend a dividend of 10 per cent. (including the interim distribution) and a bonus of 10 per cent., both free of tax, carrying forward £19,768.

Dick, Kerr & Co., Ltd.

Mr. Claud T. Cayley (Chairman) presided on October 14th, at the Cannon Street Hotel, E.C., over the annual meeting.

The Chairman, in moving the adoption of the report (Elec. Rev. p. 505), congratulated the shareholders on the figures therein contained. They had gradually improved, so far as profits earned were concerned, from two years ago. Then the profit was down to about £3,000. In the next year it was £30,000, and now it was nearly £45,000. He could not promise them that it was going to continue at the same rate, but at all events they must rest assured that the directors and staff would do all that could be done. In considering the accounts, he would like them to bear in mind that they indicated the position of the company's finances as at 30th June last, and that, as pointed out by the auditors in their report, no provision had been made for whatever effects the present state of war might have on the assets. It was satisfactory to see that the item "Capital expenditure at the works, including goodwill and patents," showed a reduction of about £14,000, as compared with last year; the depreciation having been maintained as in previous years, this reduction indicated that less expenditure than usual had been incurred in extensions to plant. The sum representing the value of the "Stocks in hand and works in progress" showed a slight increase over what was already last year considered high-water mark, and it was gratifying to know that they started the present financial year with a considerable amount of orders in hand. On the other side of the balance sheet, he need only mention the elimination of the item shown last year as "loan from bankers," the directors having taken an opportunity which presented itself of obtaining the necessary financial accommodation in another way. This was the explanation of the "Contingent Liability, No. 4." No doubt they were anxious to know what the prospects were for the immediate future, and what permanent effects were to be anticipated as the result of the war. To intelligently understand the position it was, he thought, necessary to emphasise what he fancied few of them realised, namely, the ramifications of the company's business. Most people to-day considered Dick, Kerr & Co. as being solely an electrical manufacturing concern, but those who had been shareholders since the earlier days of the company would recollect that at one time they were primarily a contracting firm, and that it was only some fifteen years ago that they found it necessary to become manufacturers of electrical apparatus so as to enable them to carry out advantageously the large contracts then in hand for tramway construction. As the importance of the contracting department declined with the diminution of the demand for new tramway construction, the manufacturing department increased in importance. Now, owing to the policy adopted some years ago of extending the contracting department in other directions, they had reached a condition of having two distinct sections, approximately equal in importance, and which in future could be expected to materially assist each other. As instances of the class of work dealt with by the contracting department, he would mention the construction of a railway 90 kilometres in length for the Government of Portugese East Africa, which had just been completed, and a contract lately entered into with the Metropolitan Water Board for the construction of a very large reservoir representing some six years' work. In the other section, which he would designate as the electrical manufacturing department, he would instance the contracts now in hand with the London and South Western Railway Company for the complete equipment of the generating station for the supply of current for their suburban electrification scheme, and with the Lancashire and Yorkshire Railway Company for the supply of the machinery and apparatus for the complete electrification of their Manchester suburban lines. These two sections represented the main business of the company. But there was a third department, namely, the general supply, or, as they would call it, the merchant business. This department was chiefly concerned with the supply to customers of such general engineering machinery and electrical supplies as they themselves manufactured, and also such as their experience of this class of work enabled them to obtain from other sources to the advantage and satisfaction of their clients. He had entered into these details for the purpose of explaining that their ramifications were such that, while undoubtedly some departments would be detrimentally affected by the war, others might be expected to derive certain advantages. It was to be assumed that for some time to come the construction of public works both in this and in foreign countries, would be deferred, but so far as their contracting department was concerned, the Metropolitan Water Board contract should fill the breach to some extent. Concerning the prospects of British manufacturers of electrical machinery, there was much being said in the public press regarding the benefits to be reaped owing to the removal of German competition, but it must be borne in mind that the elimination of Germany as a competitor did not necessarily signify the entire absence of competition. It was far from his intention to attempt to enter the arena of political economy, but it appeared to him that to whatever extent Germany might be crippled financially for the time being, she would make stupendous efforts to regain her lost markets. The German manufacturers, as they well knew, possessed the advantage of having their home markets to themselves, and with their home demand as a profitable nucleus they were enabled to compete for business abroad on a more favourable basis than could the manufacturers of a country where it had to be all grist that came to their mill. But another factor, of no less importance, was the financial assistance which German manufacturers had been receiving from their banking institutions. What an immense advantage such assistance denoted could only be fully realised by those directly connected with the management of manufactories turning out large and expensive classes of machinery, where the acceptance of an order of any size involved the locking up of capital from the time the raw and half-finished material was purchased till the machines were completed and delivered, a period usually extending over many months. Hence it was surprising, but nevertheless gratifying, to find that British manufacturers had, to some extent at all events, been able to put up a fight considering the limited resources at their disposal. Taking all the indications, as they presented themselves at the moment, into consideration, the directors were of the opinion that they would have to tide over a lean year or two before they could hope to see the dawn of an increased demand for the heavy class of machinery in which they specialised. In their merchant business they looked for, and indeed were already experiencing, an increased turnover. Certain classes of apparatus in which they had specialised were of the nature required for camp and transport equipment. As regarded their electrical supplies department, he might instance the steady growing demand for their metallic filament lamps, the sale of which had been greatly retarded in the past due to keen continental competition. Summing up, therefore, while no one was in a position to prophesy what the future had in store for them, particularly at a time when Europe was in the throes of an upheaval such as the world had never before witnessed, he had no hesitation in telling them that the company's organisation was such as to inspire confidence in its ability to hold its own, especially if the preference shareholders, at the meeting which was about to be held, would place them in a position to take full advantage of future possibilities.

Mr. R. H. Prestwich seconded the motion, and it was carried without discussion.

The Chairman and Mr. T. D. Lingard were re-elected directors.

Mr. Hoyle proposed a vote of thanks to the Board and the staff.

Mr. Fox, in seconding the motion, said that in the engineering world they had watched the gradual recovery of the company to its premier position. They had not lost sight of the fact that in the electrical world the company, as regarded both its capital and constitution, was the premier electrical company of the country.

The motion was carried, and the Chairman, in reply, said the Board owed a great debt of gratitude to the managing director, Mr. Rutherford, for the extremely able manner in which during the past few years he had managed the affairs of the company.

A meeting of the preference shareholders was then held, and the Chairman proposed a resolution to the effect that the borrowing powers of the company be increased by the issue of second debentures, but that the total issue of first and second debentures should not exceed £650,000. He said it did not follow that the directors would issue the debentures, but they asked for power to do so.

Mr. Gamlin pressed for more information, as it seemed rather a large order to ask for such powers when no ordinary dividend was being paid and when they had used up the whole of the reserves.

The Chairman said it was not correct to say they had used up their reserves. They had simply transferred it from one column to another. The issue of second debentures would not affect the preference shareholders. When they entered into a large contract they saw to it that they made enough profit to pay interest on the money which had to be borrowed. They would only issue what debentures were necessary, and it would mean getting rid of other obligations.

A shareholder said it was quite legitimate to issue debentures to carry out contracts they expected to get. Apparently the Board asked for powers to issue £236,000 second debentures, and it would be interesting to know what rate of interest they proposed to pay.

The Chairman said that obviously at present they could not make any issue, and consequently they had not seriously considered the rate of interest. What they could do, however, if they had a large contract, was to use the debentures as collateral security and borrow from the bank.

The resolution was seconded by Mr. Prestwich and carried.

Spanish and General Wireless Trust, Ltd.—A financial daily states that the accounts for the 12 months to June 30th show a loss of £1,068, reducing a credit balance brought down to £3,586.

Electric Welding Co.—The *Financial Times* states that the report of this company says that as soon as the balance of the capital has been collected, the directors propose to submit suggestions for the liquidation of the company.

Anglo-Portuguese Telephone Co., Ltd. — The directors have declared an interim dividend of 3 per cent., less income-tax.

Brazilian Traction, Light and Power Co., Ltd.— The directors have declared a dividend of 1½ per cent. on the issued ordinary capital stock.

Norwich Electric Tramways Co.—The directors report that the results for the year to June 30th were as follows:—Total receipts, £39,120; total expenditure, £28,044; net profit, £11,076, plus £140 brought forward, making £11,217. The directors recommend that £2,500 be placed to reserve fund account, £7,920 to the payment of 3 per cent. dividend, and £797 to be carried forward.—*Financier.*

Yates & Thom, Ltd.—The directors' report for the year to August 8th last, states (says the *Financial Times*) that the net profit, after providing for depreciation of plant and machinery, interest on mortgage debenture stock, and £2,000 to write down investments, is £14,520 which, with £6,928 brought forward, makes £21,448. The directors recommend a dividend for the year on ordinary shares at 2½ per cent., less tax, transferring to reserve fund £4,000 and carrying forward £8,428.

La Plata Electric Tramways, Ltd.—The report (according to the *Financier*) states that the result of the working for the half-year to June 30th shows receipts £29,699, expenses £22,098, profit for half-year £7,601, plus £330 brought forward. After allowing for debenture stock and other interest, but without any further contribution for reserves or renewals fund, there would remain a balance of £5,212.

Brisbane Electric Tramways Investment Co., Ltd.—The directors have decided to postpone the payment of the final call of £2 on the new ordinary shares from October 15th to November 16th. It has been decided to pay the usual interim dividend of 4s. per share on the ordinary shares on December 1st.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the four weeks ended August 28th, 1914, amounted to 1,387,301, compared with 1,267,735 units in the corresponding four weeks of 1913.

Anglo-American Telegraph Co., Ltd.—Interim dividend for the quarter ended September 30th, 1914, of 15s. per cent. on the ordinary stock and £1 10s. per cent. on the preferred stock, less income-tax, payable on October 31st.

STOCKS AND SHARES.

Tuesday Evening.

From the Stock Exchange point of view, the news which has come through since last week has been of the mixed variety, with the pleasant side uppermost. Monday's dispatches from General French, with the steady progress made by the Allies and the Naval engagement in which four German destroyers were sunk, put more heart into Stock Exchange quotations than was in them just previously. It is a little curious to notice how the fortunes of war are reflected in tendency rather than in prices; good news brings along buyers of Consols, Canadian Pacifics, a few oil shares and foreign bonds; whereas, when the contrast is provided, business shrinks to nothing at all, so that firms of brokers with large *clientèles* may go for a couple of days without doing a solitary transaction. Efforts are being directed towards reopening the Stock Exchange in time for a settlement on November 18th, but, pending some announcement of Government guarantee to bankers in respect of Stock Exchange loans, it is difficult to see how the markets can be restarted without grave danger to prices, and therefore to public peace of mind.

The success of the London and South-Western Railway issue has already been noted here. The price rose at one time to 2½ premium above the issue price of 99¾, but some of the allottees found the premium too great an attraction not to be secured; and, on a little selling, the price backed to 101½, to rally again to 102½. At this the return per cent. is £4 10s., if the issue is repaid in five years, or £4 15s. per cent. if it runs for its allotted span, till 1924. Other Home Railway stocks are distinctly dull. Metropolitans have gone back to 30½, Districts to 18¼. Underground Electric "A" shares keep firm at 6s., on the assumption that the London General Omnibus Company must be doing extraordinarily well in consequence of the war, and is likely to continue its present prosperity.

The chairman of the Underground Electric Railways Company is Sir Edgar Speyer, whose recent retirement from his well-known firm of Messrs. Speyer Brothers is a formality brought about by reason of the war. The firm has occupied such a prominent position in the financial world connected with London's tubes and trams, that rumour was disposed to link Sir Edgar's retirement with the dulness of Metropolitans and Districts, though, in point of fact, the two things had no connection.

Home Railways, as a whole, have given way principally because of the uncertainty that has arisen with regard to the next dividend-payment possibilities. The official announcement that the Government would make up to the railways such amount of traffic as they might lose in connection with movements of troops, has not been followed by any statement as to the policy which the companies themselves will pursue with regard to the next dividends. Therefore, the hyper-cautious are hinting at the possibility of substantial reductions, as to which it may be pointed out that the pessimists are taking time by the forelock, inasmuch as the railway world has only just lately completed the first half of the second six months of the year. The Home Railway market is in a tender condition, and it takes little to bring about such cessation of buying orders as is immediately reflected in falling prices.

The melancholy appearance presented by London streets after dark is about as bad an advertisement as could be devised for the shares of the Metropolitan electric supply companies. Ingenuity strives to probe what may be the reasons at the back of the official mind for plunging London into more than semi-darkness, when to the plain man in the street there seems so little obvious need for it. Electric lighting shares have not given way, simply because there is no active market in them.

Amongst the few things which have changed hands within the last few days are Chelseas, done at 4⅜, Metropolitan Ordinary at three guineas, City of London Preference at 12¾, and County Preference at 11⅛. The River Plate Electricity Supply Company has put forward proposals for the raising of fresh capital, in the shape of new 6 per cent. Preference stock; and a meeting has been called to give effect to this.

The London County Council, at its first meeting after the summer recess, adopted without debate a recommendation that notice should be given by public advertisement of the Council's intention to consider at the meeting on November 10th the proposal that it should take the necessary measures for promoting Parliamentary legislation dealing with the establishment of a new electricity undertaking for the County of London and certain adjoining districts. The prophetic is always a dangerous *rôle*, otherwise we should feel tempted to guess that the coming proposals are not likely to differ greatly in principle from those advocated in one or two previous schemes.

The British Electric Traction Company announces that it has received substantial support for its scheme of re-organising the capital, but that, having regard to the present state of affairs, the directors deem it advisable to take no steps just now. Consequently the matter is shelved for a while. Since the Stock Exchange closed there have been few dealings in the company's securities; prices are merely nominal.

The Brazilian Traction Company has aroused some criticism, as well as pleasure, by announcing the usual quarterly dividend of 1½ per cent. on its Common shares. The declaration had the effect, anyway, of raising the price from 45 to 47, at which it now stands. The criticism was directed to the obvious fact that, at a time like this, exceptional steps for strengthening the financial position of any company would be fully justified, and that the distribution of this 1½ per cent. did not err on the side of austerity.

It may be pointed out that the bargain-hunter has a fine chance, at the time of writing, in a small scrap of Sao Paulo Tramway, Light and Power First Mortgage bond, which is offered at 83, and could probably be picked up nearer 80. On July 30th the price was 99, and the security at the back of the bond is covered many times.

This week's new issue in the electrical department is $500,000 1st Mortgage Sinking Fund 5 per cent. Gold Bonds, offered by the Pennsylvania Water and Power Company at 88 per cent., plus accrued interest. The price, when the House closed, of the existing issue of bonds was 95½ middle; and the company's report, issued from New York on September 30th, showed the business to be advancing by leaps and bounds. The present issue is required for reimbursement of the company's treasure for moneys expended out of income on an extension line to Baltimore. At the end of October there should be a total installed capacity of 111,000 H.P. The actual price in London works out to 92½ for people who pay up at once, and £92 10s. 9d. for those who elect to pay by instalments.

In the Telegraph market, the tendency has been for people to pick up some of the Preference issues, such, for example, as Globe Telegraph and Trust Preference, wanted at 12¼ or rather more; Anglo-American Telegraph 6 per cent. Preferred, for which prospective buyers are bidding 100, and several others of the same kind. Eastern Telegraph Ordinary stock is quiet at 125. Eastern Extension shares are 11½, and have changed hands on the basis of this figure within the past day or two. New York Telephone bonds are firm at 95, which includes the interest due on November 1st. Marconis dipped to 30s., but rallied again to 1⅛. Canadian Marconis are duller at 4s. 6d., Americans at 9s.

The improvement in Manufacturing varieties still continues. Edison & Swan partly-paid are a shilling up at 5s. 6d., and the full-paid are ½ to the good at 1⅛, while business was done the other day in the company's 4 per cent. Debenture stock at 59. British Westinghouse Preference changed hands at 30s. 3d. For other shares of this class there is a steady demand, without causing much alteration, however, in the prices.

Of the foreign traction stocks, Anglo-Argentine 4½ per cent. Debenture at 95½ looks dear in comparison with the company's 5 per cent. Debenture stock, which can be picked up at a little below 90. Adelaide Electric 5 per cent. Debenture—indicated here the other day as cheap at 102¼—is now ¼ higher, investors absorbing the security day by day. Consolidated Company of Baltimore Debenture stock has been done at 100½ *ex* dividend, which is a good price for it.

Armament shares have experienced a certain weakness, there being pressure to sell from provincial centres where, apparently, money was wanted. Vickers fell to 33s., Armstrongs to 37s. 6d., B.S.A. to 52s. 6d. But rallies have since taken place, and the respective prices at the moment are 33s. 10½d., 38s. 6d. and 53s. 6d. The Rubber market calls for no particular attention. The material has gone up a trifle, though not sufficiently to bring about any change in prices of shares. This market, with the rest, was favourably affected by the more satisfactory character of the news received last Sunday and Monday.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING SEPTEMBER, 1914.

We publish herewith the September returns of electrical export and import business, which, it will be noticed, show a considerable recovery over the August figures.

In the export section the September total amounted to £287,751, a figure which, while it compares badly with the half million per month average before the war, yet represents a satisfactory increase on the total of £238,621 recorded for August.

The imports total for September amounted to £111,174, also representing a comparatively large increase as compared with August (£87,031), while the re-exports at £9,116 were about £1,000 less than in August.

While the machinery exports remained practically stationary as compared with the previous month, considerable improvement is shown in almost every other export section, and, although business is on a reduced scale, it is being maintained all over the world.

The electrical imports, which, for various reasons, are of interest at the present time, show an increase in value of £24,000 on the month, for although German business with us has vanished, our trans-Atlantic cousins and other neutral countries have increased their supplies to this country.

Particularly does this apply to Holland, which supplies the only notable example of a great increase on pre-war trade, and which sent us some £9,500 worth of electrical material in September, almost entirely comprising lamps and lamp parts.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	211	...	26	200	...	246	1,780	24	13	42	130	...	2,672
Germany	...	...	...	...	...	...	...	...	...	...	...	...	...
Netherlands, Java and Dutch Indies ...	332	...	253	...	...	...	193	686	...	24	110	...	1,598
Belgium	...	...	...	...	...	...	180	...	47	...	150	5,202	5,579
France	16	...	7	...	...	...	559	...	...	...	210	20	812
Portugal	1,211	92	15	86	...	...	333	100	...	8	519	46	2,410
Spain, Canary Isles and Spanish N. Africa...	453	210	45	...	...	20	1,060	48	10	...	50	562	2,458
Switzerland, Italy and Austria-Hungary ...	23	...	91	...	...	50	2,869	...	101	164	...	1,919	5,217
Greece, Roumania, Turkey and Bulgaria ...	24	...	29	35	...	...	...	...	...	...	...	132	220
Channel Isles, Gibraltar, Malta and Cyprus...	147	232	42	16	...	32	71	37	14	...	14	75	680
U.S.A., Philippines and Cuba	118	160	494	12	...	63	995	...	46	...	...	120	2,008
Canada and Newfoundland	447	1,283	477	831	...	130	10,796	3	2,500	2	6	513	16,988
British West Indies and British Guiana ...	112	11	117	147	...	...	279	...	3,606	...	189	154	4,615
Mexico and Central America	...	...	...	...	...	...	26	...	34	...	...	...	60
Peru and Uruguay	116	...	244	7	...	...	222	...	...	6	661	167	1,423
Chile	364	...	15	74	...	30	385	2	10	2	132	306	1,320
Brazil	163	473	632	266	...	20	1,944	1,090	237	...	72	481	5,378
Argentina	7,050	1,161	4,109	225	325	75	14,610	758	336	61	1,417	1,128	31,254
Colombia, Venezuela, Ecuador and Bolivia...	103	...	...	...	...	29	10	...	...	...	...	...	142
Egypt, Tunis and Morocco	432	347	167	44	...	5	1,274	431	25	21	259	966	3,971
British West Africa	198	38	12	105	...	...	80	5	13	...	92	96	639
Rhodesia, O.R.C. and Transvaal	1,407	3,890	901	1,588	51	240	1,526	5	83	...	27	67	9,785
Cape of Good Hope	686	1,177	749	655	182	217	4,526	832	314	110	42	281	9,801
Natal	733	9,402	193	165	...	379	1,155	495	61	33	151	...	12,767
Zanzibar, Brit. E. Africa, Mauritius & Aden	274	11	54	52	...	30	...	54	13	...	144	261	893
Azores, Madeira and Portuguese Africa ...	4,537	1,239	124	59	...	205	...	41	...	...	...	54	6,259
French African Colonies and Madagascar ...	...	...	...	...	...	...	...	...	...	...	...	...	...
China and Siam	562	430	363	...	...	1,309	1,752	296	26	...	140	439	5,317
Japan and Korea	134	...	5	...	...	851	5,384	298	1,301	...	...	...	7,973
India	2,821	10,135	6,076	1,350	84	691	20,586	3,712	1,794	51	2,116	938	50,354
Ceylon	223	351	171	135	87	25	3	118	59	...	120	40	1,332
Straits Settlements, Fed. Malay States and Sarawak	354	1,016	259	82	...	278	1,227	295	343	...	1,181	540	5,575
Hong Kong	680	4,437	161	...	...	18	634	481	21	...	130	17	6,579
West Australia	685	3,353	90	599	35	847	...	480	1,359	27	12	58	7,545
South Australia	238	744	97	273	...	4	854	...	31	...	247	35	2,523
Victoria	1,346	8,795	1,295	987	51	1,466	2,950	107	473	119	1,727	7,125	26,441
New South Wales	1,636	9,699	1,247	2,308	100	336	7,430	1,055	2,233	2	1,690	3,301	31,037
Queensland	653	36	110	91	16	23	64	384	34	...	1,279	...	2,690
Tasmania	43	...	43	134	...	116	341	...	...	...	...	...	677
New Zealand and Fiji Islands	1,814	1,163	1,785	438	155	469	2,961	304	551	19	143	957	10,759
Total, £	30,346	59,885	20,498	10,964	1,086	8,234	89,050	12,141	15,687	691	13,160	26,000	287,751

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway, Sweden and Denmark ...	260	...	105	6	188	...	3,185	...	901	1,603	1,181	7,429
Germany	...	...	...	...	...	...	...	...	...	...	...	...
Holland...	15	...	...	3,908	5,367	...	95	20	...	...	19	9,424
Belgium	...	51	...	...	...	...	1,800	...	...	156	16,693	18,700
France	13	...	60	...	89	8	1,904	...	...	956	220	3,250
Switzerland	162	208	...	...	70	2,814	...	...	...	320	...	3,574
Italy	...	2,854	...	...	...	...	1,248	...	...	...	...	4,102
Austria-Hungary	...	...	...	...	...	...	...	...	...	...	...	...
United States	5,792	376	237	...	200	97	11,906	13,246	1,143	319	125	63,441
Total, £	6,242	3,489	402	3,914	5,914	2,919	20,138	13,266	2,044	3,354	18,238	109,920

Additional imports: Spain: carbons, £1,213. Canada: electrical goods, £41.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above... ...	1,974	954	...	805	121	...	3,025	...	148	12	2,075	9,116

Total Exports: £287,751 Total Re-Exports: £9,116 Total Imports: £111,174

Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third column contains many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

LARGE INDUCTION MOTORS: SOME FEATURES OF MECHANICAL DESIGN.

By G. MOORES, B.Sc. Eng.

(*Continued from page* 517.)

Shafts.—The provision of a shaft of ample strength and rigidity is, of course, a vital necessity in the design of a large motor, and we find in practice that the proportions of a shaft are usually dependent not on the stresses due to twisting and bending, but on the maximum permissible deflection, which latter is generally determined by the size of the air-gap of the machine. When the shaft is deflected, or when the rotor for any other reason is displaced from the true centre of the bore of the stator, there comes into play an unbalanced magnetic pull which tends to increase the displacement, and therefore the deflection of the shaft. This magnetic pull may act downwards in the same direction as the weight of the rotor, hence it must be allowed for in calculating the shaft deflection.

There are several approximate methods of determining the amount of this deflection, based upon the assumption of a parallel shaft of equivalent diameter, but as this assumption frequently introduces considerable error, it is often necessary to calculate the deflection by some more accurate method. An example from actual practice is given here of a graphical method of doing this which is as convenient and gives as great a degree of accuracy as any. The case is one of a 2,000-H.P. motor running at a speed of 490 R.P.M. The weight of the rotor was 11,000 lb., and the unbalanced magnetic pull calculated for a deflection of 0·01 in. was 13,000 lb. The weight of the collector was 500 lb., and the weight of the shaft is allowed for in the loads shown.

The shaft is first drawn to scale, and the bending moment curve, fig. 28 (*c*), is obtained as follows:—Drop ordinates as shown from centres of loads and centres of bearings, fig. (*a*). Draw the vertical load line, fig. (*e*), with divisions proportional to the various loads. Choose any pole distant H from the load line, and join up the various points on the load line to this pole. Then by drawing lines parallel to these, complete the polygon fig. (*c*). Note that the resultant line of this polygon is parallel to the dotted line in fig. (*e*), which latter dotted line divides the load line proportionally to the loads on the bearings.

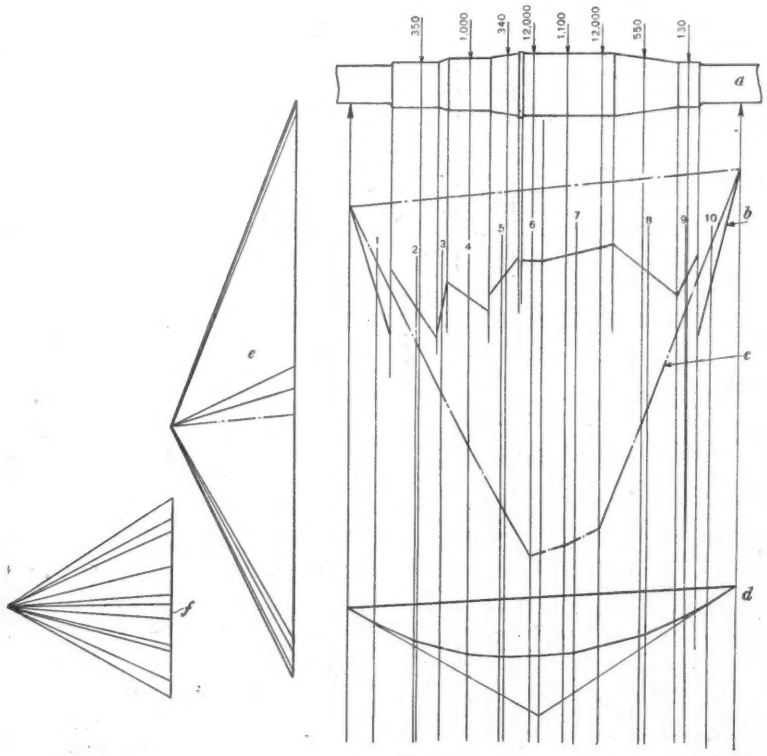


Fig. 28.

Let scale of shaft length be "h" inches per inch, and scale of loads be "d" lb. per inch. Then the bending moment at any point on the shaft = x d h H inch lb., where x is the depth of the diagram in inches vertically below the point considered.

To construct the deflection curve the procedure is as follows:—From each shaft shoulder, and from as many points between the shoulders as necessary, drop ordinates as shown in the figure. Let depth of B M. diagram at any one of these ordinates be a inches. Divide each value of a by D^4, where D is the diameter of the shaft at each ordinate considered. We now require a curve whose ordinates are proportional to these values a/D^4. As these values are unworkably small, multiply by some convenient number approximately equal to D^4 (taking a rough average value of D)—in the present case 10^4 was chosen. Then on the ordinates last drawn mark off lengths $b = a/D^4 \times 10^4$.

By joining up the various points, complete now the several figures 1 to 10 fig. (*b*). Then from the centres of gravity of these figures drop ordinates as shown through fig. (*d*). Compute the area of each figure in fig. (*b*), and by reducing to some suitable scale "l" sq. inches per inch, construct a load line—fig. (*f*)—reckoning the areas as loads. Take a pole distant M from this load line, and join up as shown. Complete the polygon, fig. (*d*), in a similar manner to the B.M. diagram.

Now this polygon is the deflection diagram, and the depths at various points are proportional to the deflections at these points. With scales as given above, the scale of the deflection diagram will be $\frac{M\,H\,h^3\,l\,d}{E\,\frac{\pi}{64}\,10^4}$ inches per inch.

If lines are drawn in fig. (*d*) parallel to the two outside lines in the load diagram, then these lines will intersect at a point vertically below the maximum depth of the deflection diagram. Then by measuring this depth and dividing by the above scale, the maximum deflection of the shaft will be obtained. In the present example the scales used were (in the original which is here reduced) h = 0·1 in. d = 2,000 lb. H = 3 in. l = 4 sq. in. M = 4 in. The scale of the deflection diagram was, therefore, 148·5, and its depth measuri 1·39 in., the actual deflection w 1·39/148·5 = ·0094 in.

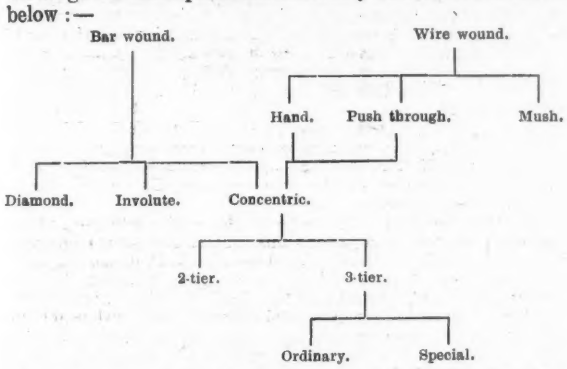
As an instance of the degree of accuracy obtainable in the construction of these figures, it may be mentioned that two persons recently drew the figures for a particular case, using different scales and different positions of ordinates, and their results differed by less than 2 per cent.

Shafts for large high-speed motors are frequently specially constructed to provide air passages through the punchings which are mounted directly on the shaft. Sometimes such shafts are swelled out at the centre, and large slots, like keyways, are milled along the centre portion. These slots allow air to obtain access to ventilating spaces which are provided in the rotor. In the rotor previously illustrated of the British Thomson-Houston high-speed motor, the shaft is milled down at the centre to a triangular shape for the same purpose.

Stator Windings.

It will be assumed, unless otherwise stated in dealing with this subject, that stators have half-closed slots, as open slots

are rarely met with in large induction motors. Stator windings for three-phase machines may be classified as shown below :—



The slots may be either "bar" or "wire" wound ; in the former case the bars must be pushed through the slots from one end, and in the latter case there is a choice of three methods :—(1) Threading the wire through from one end of the slot by hand, one turn at a time, *i.e.*, hand-winding ; (2) forming coils, usually termed "mush" coils, roughly on a mould, and inserting them in the slot by

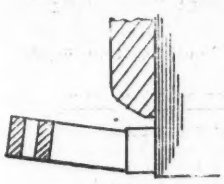


Fig. 29.

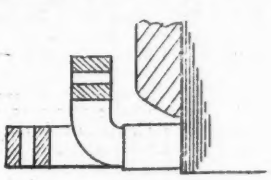


Fig. 30.

slipping one wire at a time through the slot opening, which must be larger than the diameter of the wire ; (3) forming what are known as "push-through" coils on a mould. This last type of coil is formed with its individual turns disconnected and their ends straightened out ; the complete coil is pushed through the slots from one end

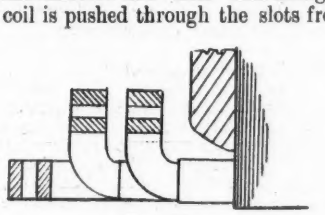


Fig. 31.

of the machine, and its disconnected ends are then bent over and connected to one another so as to put the turns in series, or parallel, or as may be required.

The end connections of a stator winding—that is, the portion of the coils outside the slots—are made in various

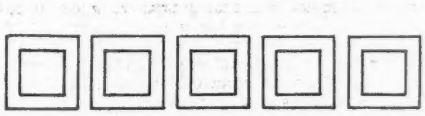


Fig. 32.—Single-tier Diagram

shapes, the chief being the "concentric" type, the "diamond" or "barrel" type, and the "involute" or "butterfly" type.

Bar-wound machines may be made with any of these

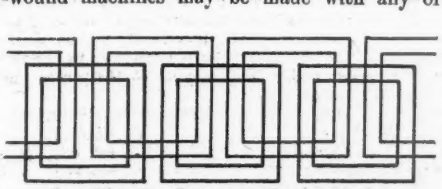


Fig. 33.—Two-tier Diagram.

three types of end-connections. Of wire-wound machines, those that are hand-wound are nearly always of the concentric type, as also are practically all push-through coils.

Concentric windings for single-phase are wound "single tier" or "single plane" (fig. 29), for two-phase they are two tier, and for three-phase either two tier (fig. 30) or

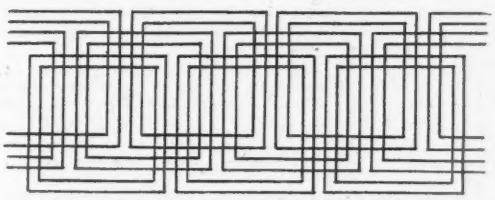


Fig. 34.—Three-tier Diagram, Ordinary.

three tier (fig. 31). Further, three-tier windings may be either ordinary, or specially arranged to be suitable for a

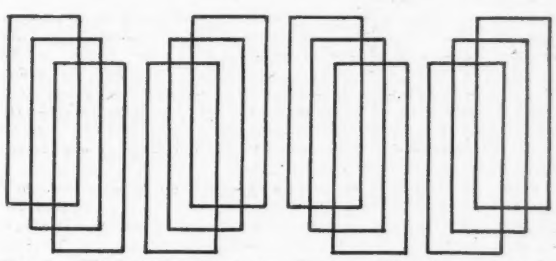


Fig. 35.—Three-tier Diagram ; Special—For Split Stator.

split stator frame so that no coils will have to be interfered with when one part of the stator is removed. Diagrams of these four types of concentric windings are given in figs. 32 to 35.

(*To be concluded.*)

ELECTRIC BRASS MELTING.

By G. H. CLAMER and CARL HERING.

(*Abstract of paper presented at the Annual Meeting of the* American Institute of Metals, *September*, 1914, *at Chicago, Ill.*)

The purpose of this paper is to describe some recent researches and developments in the field of commercial brass melting, with a special type of furnace. The advantages which electrical furnaces have over combustion furnaces for commercial brass melting are well known. These researches were made with the Hering furnace, a new type of electric furnace which promised to be especially well adapted to brass melting.

It is the opinion of the writers, which is also shared by many others, that the direct arc furnace will never be likely to be a commercial success for melting brass. In the direct heating resistance furnaces with which the present researches were made, the heat is set free directly in the metal itself by passing the current through the liquid metal. There is therefore no transmission of heat, hence no loss of time or temperature, and there need be no excessive temperatures. The electric energy in the metal is set free as heat instantaneously and with a perfect efficiency, the only losses being after the heat has got into the metal and in leading the current into the metal, both of which losses are subject to control.

In the type of furnace used in these researches the heat is set free as such in a small portion of the liquid metal in heating holes at the bottom of the hearth, and then by means of a pressure produced by a recently discovered and peculiar electromagnetic force known as the "pinch effect," this heated metal is "squirted" with considerable force into the main bath, whereby its heat is carried very quickly into the bath and is there distributed, and whereby the metal is at the same time very thoroughly stirred, making it uniform. The cold metal is melted by immersion in this hot bath, as in all covered crucible melting. Cold metal, when immersed in superheated liquid metal and wetted by it, takes up heat remarkably rapidly, and anything that increases the speed of melting lowers the stand-by losses, hence poking the cold metal down into the hot bath is an advantage. This "pinch pressure" operates like a valveless pump, forcibly expelling the freshly-heated metal from the heating holes or channels, called resisters, and sucking in the cooler liquid metal from the bath.

This peculiar and heretofore unknown electromagnetic force, which is of considerable magnitude, was noticed by one of the authors some years ago, in a resistance steel furnace with open channels, and proved to be fatal to that furnace, as it kept breaking or pinching off the column of liquid by crushing it ; it is the first mechanical force internal to a conductor known to the electric art, all the other forces being external. In the present type this force was applied to circumferentially closed channels of liquid

metal submerged beneath the bath, so that rupture could no longer take place; the force tending to crush the conducting column of liquid metal was thereby made to "squirt" it out of the heating holes, whereby the absolutely essential rapid circulation in these heaters is produced. This type of furnace is sometimes referred to as the "pinch effect furnace," as this peculiar force is the underlying and essential feature of it.

Such a furnace heats the liquid metal from the bottom, which is the correct way to heat any liquid, and of course the most rapid way; for this reason, and the fact that the electrical energy is converted into heat instantaneously (that is, without involving the slower transmission by radiation or conduction), the heating can be done very rapidly, depending on how much electric power one is willing to use.

Due to this rapid heating the losses of heat are reduced, because the time during which the metal is kept hot is shortened. If a ton of metal per hour is melted and poured in 500-lb. lots every 15 minutes in a small furnace, the continuous stand-by losses through the walls and the top will be only those from 500 lb., while if melted and poured in ton lots every hour these losses will be several times as great.

The ideal method therefore is to melt and pour as quickly as possible, hence in as small lots as the particular conditions of the foundry require, though this of course need not be carried to extremes. It is thought, however, that for small castings at least, a high-power tilting brass furnace of this type could be constructed small enough to be transported to the moulds, pouring directly into them, thereby saving the process of pouring with a ladle, with its labour cost, and the cost of the superheat necessarily involved in indirect pouring.

In general this furnace consists of a shell lined so as to form a hearth. At the bottom of this hearth there are several cylindrical holes, usually inclined, extending into the lining and closed at their outer ends by the metallic electrodes, usually made of the same metal as that to be melted, or of graphite. The electric current, led into the furnace by means of these electrodes, passes through the columns of liquid metal in these holes, and it is here that the electric energy is converted into heat and the freshly heated metal is squirted out into that in the hearth. These heating holes are technically called the resisters, as it is the electric resistance of the metal in these holes which causes the electric energy to be converted into heat. The electrodes lead out to the outside of the furnace, where they are attached to transformers in which the kind of current required by this furnace is generated. These transformers are preferably secured mechanically to the shell; hence the heating can continue while the furnace is tilting for pouring.

In starting from the cold state this furnace must first be primed with a small charge of liquid metal, enough to fill the holes and the bottom of the hearth, so that the circuit for the current is established. A few fragments of zinc, tin or aluminium inserted in the bottoms of the holes ensure the union of the liquid priming metal with the electrodes at the first start from the cold. During regular pouring, enough liquid is retained to maintain this electric circuit.

On shutting down the furnace, it is tilted or drained so far that the heating holes are also emptied of their metal except for a short stump at the bottom. In some cases the charges in the furnace were allowed to freeze, and it was afterwards started up again by melting the solid charge with the current; but at present this is not recommended as a general rule except when the metal in the furnace is not hot short, as hot short metal is apt to break the electric circuit by cracking in the resisters when the furnace cools or is heated up. A blast fuel flame is desirable for starting up a furnace with a frozen charge.

An electric furnace has its best efficiency when run continuously day and night; this is also better for the lining, which may become strained by repeated heating and cooling. The cost of electric energy is also generally less per KW.-hour for continuous than for intermittent supply. When this continuous running is not practicable, this furnace may be kept hot overnight with about 20 per cent. of its normal input. A large body of metal in a well-heated and well-insulated furnace will keep liquid in the bottom for a number of hours without any current.

In its present form this brass furnace requires very little attendance while running normally, and it is at its best when run at a uniform rate of melting. One operator can well attend to several furnaces or undertake some other duties. It requires intelligent care when starting from the cold to establish good electrical contact with the fluid priming charge; this starting is easily learned, but must be done conscientiously; after first starting no particular care is required.

The chief attention required during normal running is not to waste electric energy or endanger the lining or the electrodes by unnecessarily high temperatures, as the heat accumulates rapidly after the metal is all melted; its temperature had best be determined by the use of pyrometers, which is convenient in this type of furnace.

Any degree of superheat can be obtained, depending only on the money one is willing to spend for this superheat. One need merely keep the melted metal in the furnace with the full current on. Owing to the higher cost of electric heat, it is, of course, desirable to require as little superheating as possible. The ideal method would be to cast directly from the furnace into the moulds, by bringing the moulds to the furnace, say, on a sort of suspended carrousel or by floating them on a canal. Every degree of superheat saved adds to the efficiency of the furnace and to the daily output of a given furnace.

There is no danger at all of "burning" or oxidising the metal, as the air can be entirely excluded and the atmosphere may even be made reducing with charcoal. Sulphur fumes are of course absent. The zinc loss is practically negligible, as the furnace is normally sealed, being opened only for charging and pouring.

The regular and continuous upward motion of the metal squirted from the heating holes brings all the molten metal repeatedly to the top, where all suspended matter is released and then floats. Hence there takes place a kind of mechanical refining of the metal.

The loss of brass in the ashes in the ordinary fuel melting processes, is, of course, entirely avoided. This, together with the practically negligible loss of zinc as fumes, means a saving in the metal, and the value of the metal thus saved goes well toward paying for the current.

The wearing away of the walls of the heating holes was at first expected to be an important matter, but this wear seems to be either negligible or entirely absent even in steel furnaces, in which the temperatures are much higher; the latter become coated with a black layer which seems to replace itself as fast as it wears away. In brass furnaces, when care is taken not to let any slag get into the holes on emptying the furnace completely before a shut-down, the walls of these holes remain clean and smooth, and are entirely unattacked.

The cost of relining, which takes the place of the cost of the crucibles in fuel furnaces, will not be great, being no doubt considerably less than the cost of the crucibles. In the improved type, with the heating holes coming in from the side instead of from the bottom, the relining is a simple matter.

The flow of metal in the heating holes is downward at their circumference and upward in the centre; the outward velocity is by far the greater; the flow is steady and not intermittent.

A large amount of heat can be carried out of these holes effectively by the rapidly flowing metal; it exceeds that of a row of electric arcs in those holes. At present about 25 to 50 KW. are converted into heat in each hole (or, roughly, about 90,000 to 200,000 B.T.U., or 20,000 to 45,000 kg. cal. per hour) with the probability that this can be considerably increased. The correct proportioning of these holes and the current is of great importance. These proportions are quite different for brass and for steel. The furnace must be especially designed for each metal, though variations in the compositions of brasses and bronzes can be taken care of in the same furnace by regulation of the electric current.

Even copper with its very low resistance can be melted commercially in these furnaces without requiring unpractical proportions. The higher the electrical resistivity of a metal the better the proportions become.

The rapid flowing of the metal in the heating holes, which is the basis of this type of furnace, is a phenomenon based on the use of a large current, hence these furnaces must be operated with low voltages and great amperage. For this reason the currents are best converted by transformers attached directly to the furnace, as long leads for such large currents would be expensive and troublesome.

Our researches have shown, however, that the currents may be much smaller than was at first supposed. Our brass furnace is running with about half the current originally intended and double the voltage. This is due to the development of an unexpectedly high counter-electromotive force, which is a very favourable feature, as it improves the proportions of the furnaces, by enabling lower currents to be used. The energy represented by this counter-electromotive force is also converted into useful heat.

Under normal conditions the current is perfectly steady, hence these furnaces become a very desirable "load" for central stations, and may for this reason be granted lower rates, especially as the current need not be cut off during pouring, and because the furnace could easily be cut out of circuit (except for a small current to keep it hot) during the time of the so-called "peak" loads, during which the charges for current are necessarily somewhat higher.

Should the ammeter needles start to oscillate it means that the columns of liquid metal in the holes are parting either because the level of the liquid metal above the holes is too low, or in the case of zinc alloys, that the temperature is unnecessarily high, causing some zinc to volatilise and form bubbles in the heating holes. In either case the addition of some cold metal will at once stop it. The operator soon learns how to avoid both.

Any of the usual alternating currents used for lighting or power can be adapted to this furnace, as they are always transformed at the furnace to the required voltage and current. Single-phase, two-phase or three-phase currents can be used without any complications, there being then two, four or three heating holes; three-phase current is probably the best, and is the kind most generally available. Any frequency may be used, although, of course, the lower the frequency the better.

The power factor of this furnace, even with 60 cycles, was found to be in the eighties and nineties, and even this small reduction from 100 per cent. was no doubt largely, if not all, in the transformers, and could be avoided by a better design of the transformers. In a steel furnace with a frequency of 25, the power factor was practically 100 per cent.

As the top and all but one side are free from all electric appliances, the slag or skimming doors, spout, feeding hopper, roof, &c., may be located and constructed as the owner prefers. The furnace may readily be made to tilt around the spout or lip as a centre, thereby facilitating casting directly into moulds, which saves considerable expensive superheating and labour.

This type of furnace is applicable to quite small as well as to quite large sizes.

In melting many tons of light, curly and oily brass chips with much mechanically mixed iron, we cast in the form of clean ingots nearly 8 lb. per KW.-hour delivered to the furnace transformers.

equal to about 12·5 KW.-hours per 100 lb. poured; a considerable portion of this energy went into the dross and was lost through the open hopper, through which the cold charge had to be "poked." Moreover, the transformers were not working properly and were wasting much heat, and in this particular furnace there were four electrodes (for a two-phase current), instead of only three (for a three-phase current), which latter would be more general, hence the electrode losses were greater than they would be normally; and the electrodes had been proportioned for a much larger current, hence were unnecessarily wasteful in heat loss.

Short runs, with clean ingot charges, indicated that, even with these easily-avoidable excesses in the losses, 10 lb. per KW.-hour could be obtained in this furnace, hence, in better designs, even better efficiencies than this can reasonably be expected. But this figure depends largely on the amount of superheat required by the particular foundryman.

The economy of the electric melting could be greatly increased by preheating the charge with a fuel flame, preferably in an auxiliary furnace, to only such a temperature at which no oxidation takes place. Nearly half the melting heat could thus be introduced into the metal whereby the economy of the electric heating could be nearly doubled. Such low temperature heat is more cheaply produced by fuel, while the high temperature heat is introduced into the metal more cheaply electrically, hence this combination of both gives the best total economy.

Comparative costs with fuel furnaces can be only crude because the data concerning them differ so very greatly in different foundries. But taking what appear to be fair general averages largely from the recent Bulletin 73 of the Bureau of Mines compiled by Dr. H. W. Gillett, the following rough comparisons can be made:—

He concludes that the average loss of metal in fuel furnaces is about 2·5 per cent. per melt; it is probably greater in most foundries. We will assume this low figure and allow ½ per cent. for the electric furnace. Limiting this comparison to only the fuel or current, the crucibles and the loss of metal, gives the following per 100 lb., assuming $4 per gross ton for the coke, and the average value of the metal as 10 cents per pound, based on the present low metal value; ordinarily it averages about 50 per cent. higher:—

	Cents.
Tilting, forced draught, coke, furnaces:	
Coke, 20 lb.	3·6
Metal loss, 2·5 lb.	25
Crucibles	6
Total	34·6
Open flame, tilting, oil furnaces:	
Oil, 3 gal. at 4 cents	12
Metal loss, 3 lb.	30
Relining	1·2
Total (to which should be added the cost of the compressed air blast)	43·2
Electric furnace:	
Power at 1 cent per KW.-hr. and 10 lb. per KW.-hr.	10
Metal loss, ½ lb.	5
Relining	1·2
Total	17·2
Power at 1·5 cents per KW.-hr., and 8 lb. per KW.-hr.	18·8
Metal loss, ½ lb.	5
Relining	1·2
Total	25·0

The labour cost for charging, pouring and attending to the operation of the furnace may be the same, but the costs of starting the fires and for the handling of the coal and ashes, are absent in the oil and electric furnaces, and should, therefore, be added to costs for the coke furnaces. In the wrought brass industry there is a saving of labour with the electric furnace due to larger ingots, which would no doubt be a much greater item than the difference in cost of melting.

In the above tabulated data, taking as an average 38 cents per 100 lb. for coke furnaces and 20 for the electric, the saving in a plant melting 20 tons per day would be nearly $22,000 per year of 300 days; or for oil furnaces at 43·2 and electric at 20 cents, the saving would be nearly $28,000 per year, which should be credited to the first cost of the electric furnace.

In estimating the cost of melting it is important to consider not only the items tabulated above, but also the cleanliness of this "boiled" metal, the avoidance of oxidation or of the formation of sulphides, the possible uniformity of temperature, the production of any desired superheat, the possibility of casting directly into the moulds with its saving of labour, the comfort of the labourers, the economy of floor space, the increase of output by running day and night, the absence of handling of coke, ashes, oil, compressed air, &c., the saving of time in starting fires, &c., all of which have a money value also which may in some cases be even a large factor than the mere cost of the power alone. On the other side of the account is the cost of the furnace, the cooling water, its attendance (one man who could easily attend to several furnaces), and the relining; under normal running conditions there is nothing about the furnace which is consumed or wears out except the lining; the electrodes are not consumed. This furnace gives the owners of a foundry increased opportunities to carry out what is known as scientific management, or, in other words, to get the best returns per dollar invested in the plant and in its operation.

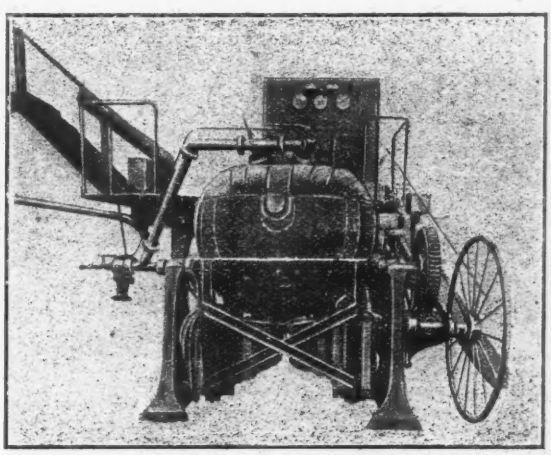
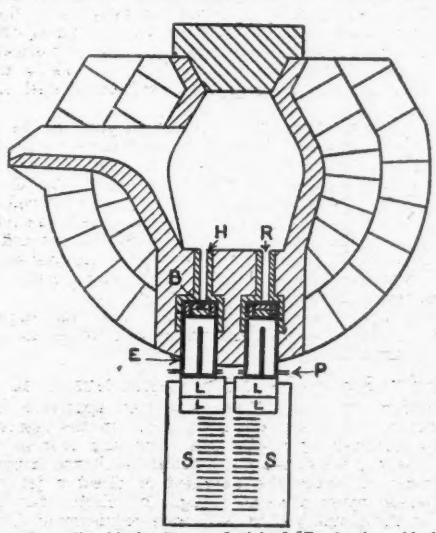


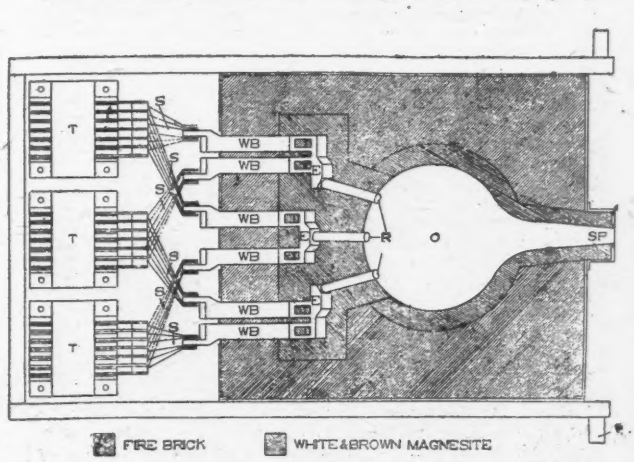
FIG. 1.—HERING 110-KW. FURNACE.

The present furnace could not be run to its full capacity of 120 KW., but only to about 110, on account of the transformers. By merely changing transformers it is probable that the rate of melting could be doubled by doubling the power input, as certain unexpected and favourable features showed themselves after the furnace was started. The hearth held about 1,500 lb., and about half of this was retained to facilitate melting the next charge. From the foundryman's standpoint the melting was quite satisfactory, and the ease of manipulation and preventing



E, electrode cooling block; S, secondary lead; B, plumbago blocks; R, resister holes; H, plumbago hoods; P, water pipes; L, electrode lugs.

FIG. 2.—JACKET AND ELECTRICAL CONNECTIONS FOR 110-KW. FURNACE.



T, transformer; S, secondaries; R, resisters; TR, trunnion; O, crucible SP, spout; WB, water block; E, electrode.

FIG. 3.—JACKET AND ELECTRICAL CONNECTIONS FOR 150-KW. THREE-PHASE FURNACE.

loss of metal leaves little to be desired. When closed there was no sensible radiant heat from the outside.

The development of this type of furnace involved many difficulties largely because it was an entirely new and somewhat radical departure from existing practice, hence no precedents existed. All the data for constructing it had to be found out experimentally, and each trial furnace had to be run to destruction to bring out its weak points. Our scrap heap contained probably about 50 furnaces.

The electrodes, which are of metal, are necessarily liquid at their hot ends and solid at the cold ends, hence must be carefully designed and proportioned, so that on the one hand they do not melt back too far, and on the other hand do not carry off too much of the heat. The earlier troubles with the lining were overcome after finding suitable materials and tamping them especially compact with a pneumatic rammer. In brass furnaces the possible troubles due to cracks in the lining around the heating holes and electrodes, whereby electrical short circuits might occur by the metal entering the cracks, were completely overcome by enclosing these parts of the furnace with hoods made of the tough plumbago used for making crucibles.

The outside of the 110-KW. furnace is shown in fig. 1. It is a two-phase furnace. The two transformers are seen underneath; they tilt with the furnace. For each transformer there are two vertical heating holes, thus making each transformer independent of the other. A three-phase furnace with three transformers, three electrodes and three heating holes, would be better. Fig. 2 is an outline and diagrammatic vertical cross-section in which B are the heating holes or resisters. In a later and better design the hearth, electrodes and heating holes are arranged as in fig. 3, which makes the relining and repairs of the heating holes easier than when they are at the bottom, as they are in figs. 1 and 2. This improved form also permits of turning around the spout as a centre, which is considered by many to be an important advantage, and which does not exist in the form in fig. 1.

The furnace shown in fig. 1 has been criticised for being so large outside; but thick walls economise heat, which is more important in electric than in fuel furnaces, as the cost per unit of heat is greater. Bricks are cheaper than kilowatts, hence the first investment in thicker walls was more economical than to suffer the continued losses of expensive kilowatts.

NEW PATENTS APPLIED FOR, 1914.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

20,540. "Electrical heating apparatus." R. H. Best & H. H. Cressall. October 5th.

20,549. "High-voltage insulated cable." C. J. Beaver & E. A. Claremont. October 5th.

20,551. "Magnetic separation." S. Bruck. October 5th. (Addition to 11,898/11. Convention date, October 4th, 1913, Germany.) (Complete.)

20,552. "Magnetic separators." S. Bruck. October 5th. (Addition to 11,898/11. Convention date, October 3rd, 1913, Germany.) (Complete.)

20,556. "Switch for testing telegraph lines." E. D. Gledall. October 5th. (Complete.)

20,557. "Electric current transmission systems." British Thomson-Houston Co. (General Electric Co., United States.). October 5th.

20,563. "Electric switches of the tumbler type." A. S. Blackman & S. R. Windle. October 5th.

20,580. Electric Lamp Holders. J. H. Collie. October 6th.

20,587. "Instrument for testing low-tension magnetos as used on internal combustion engines." E. J. Davis. October 6th.

20,595. "Fluorescent screen localiser with combination of stereoscopic photographic attachment for use with the X-rays for localising bullets and other purposes." T. Clark. October 6th.

20,603. "Attachment to prevent theft of electric lamps or globes." H. Maddick. October 6th. (Convention date, February 19th, 1914. Australia.) (Complete.)

20,633. "Accumulator cells made of ebonite or the like." E. S. Seymour and St. Helen's Cable & Rubber Co., Ltd. October 7th.

20,636. "Telegraphic gun." H. A. Whincup & H. Whitaker. October 7th

20,646. "Electricity meters." Simplex Conduits, Ltd., & L. M. Waterhouse. October 7th.

20,650. "Apparatus for generating high-tension electricity." J. E. James, J. B. Wilkie, A. Kenyon & W. Torrance. October 7th.

20,671. "Electrodes for secondary batteries." A. Connell & H. S. Hohne. October 7th.

20,687. "Means for rendering air-, damp-, and water-tight the junction of electric wires or cables with boxes or casings containing electric apparatus and the like." A. Holmes & T. H. Brierley. October 8th.

20,695. "Electric fuse or cut-out boxes having multiple ways." C. F. Parkinson, A. H. Railing & C. C. Garrard. October 8th. (Complete.)

20,714. "Apparatus for bleaching by electrolysis." J. F. Webb & Sir William W. Williams. October 8th.

20,728. "Electrical heating-elements." G. H. Collins & H. F. Collins. October 8th.

20,718. "Electric arc lamps." F. Proctor. October 8th.

20,776. "Electrical igniting-apparatus for internal combustion engines." F. E. Wilson & W. A. Shepherd. October 9th.

20,782. "Electric machines." E. Marelli. October 9th. (Convention date, October 25th, 1913. Italy.) (Complete.)

20,783. "Electric machines." E. Marelli. October 9th. (Convention date, May 6th, 1914, Italy.) (Complete.)

20,784. "Electric machines." E. Marelli. October 9th. (Convention date, March 21st, 1914. Italy.) (Complete.)

20,786. "Methods and apparatus for the determination of the complex energy delivered by alternating currents." R. Arno. October 9th. (Addition to 9,580/10.) (Complete.)

20,790. "Electric heaters." C. R. Belling. October 9th.

20,796. "Electric switches." F. B. Holt & H. Smith. October 9th. (Divided application on 25,833/13. May 11th, 1914.) (Complete.)

20,803. "Coin-freed apparatus for testing manual strength of pull and electric circuit endurance." W. Keast. October 10th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1913.

13,157. Railway Block Telegraph Indicators. A. T. Blackhall & C. M. Jacobs. June 6th.

19,125. Telegraphy. F. G. Creed, and Creed, Bille, & Co. August 22nd.

21,029. Electric Glow Lamps. C. O. Bastian. September 17th.

21,191. Illuminators or Reflectors applicable to Electric and other Advertising Signs and the like. H. Goulton. September 19th.

21,472. Magneto-electric Machines. F. L. Hollister. September 23rd.

21,921. Telephone Exchange Apparatus. D. H. Kennedy & J. W. Turner. September 29th.

21,997. Electrically-heated Hot Air Syringes used in the Practice of Dental Surgery. G. F. Gadd & Western Dental Manufacturing Co. September 30th.

22,146. System and Apparatus for High-speed Telegraphy. J. Gell. October 1st.

22,402. Electric Cooking Ovens. B. Thomas & E. Thomas. October 4th.

23,492. Electrical Cut-outs or Fuses. L. A. Waller & E. D. Rodway. October 17th.

24,560. Electrolytic Apparatus. J. T. Niblett. October 29th.

25,144. Production of Alkali Metal Alloys by the Electrolysis of Alkali Hydroxide in the Molten State and in the obtainment therefrom of Alkali Metals and Alkali Metal Compounds. E. A. Ashcroft. November 4th.

25,477. Electrical Switches or Circuit-breakers. B. Holt & H. Smith. November 7th.

26,623. Voltage Regulators for Electric Generators. A. H. Olmstead. November 19th.

30,017. Electric Bells. H. C. Tudor. December 31st.

1914.

231. Suspenders for Electric Cables and the like. P. Huntington. January 5th.

719. Sparking-plugs for Internal-combustion Engines. F. H. Bluemel & Bluemel Bros., Ltd. January 10th.

5,346. Electric Diaphragm Horns or Alarms. W. W. Dean. March 2nd. (March 15th, 1913.)

5,693. Electric Contact Devices for Arc Lamps, Variable Resistances, and the like. A. T. Dowdell. March 6th.

10,473. Electric Diaphragm Alarms. Thomas Crosbee & Sons, Ltd., and T. S. Rogers. April 28th.

12,983. Electrically-operated Lock for Railway Carriage and other Doors. J. W. Wollers, A. McCaw, & A. Wollers. May 27th.

The Electric Vehicle Committee.—A meeting of this Committee was held on October 2nd, when the final design for the standard sign for charging stations and garages was approved; it may be made up either as an illuminated sign or as an enamelled iron plate sign. The Committee inspected a sample standard charging plug and receptacle submitted to it by Messrs. Reyrolle and Co., and, having approved of it, ordered it to be submitted to the Engineering Standards Committee.

With reference to the specification for this plug, published in the Electrical Review, pages 447 and 448, the Committee decided to amend slightly the wording referring to the handle of the plug in which is embodied the cable gripping device, and to make it read that the handle can be made of malleable cast-iron. It was also decided to give the option of making the outer shell of the plug or receptacle from galvanised steel or bronze tubing.

The secretary reported that the contributions to the working fund received to date totalled £129, and there were still some promised contributions to be received.

The Committee has already fixed the standard range of charging voltage as from 85 to 120 volts, and it was decided to make it clear that this voltage was suitable for 44 lead plate cells as a maximum.

In view of the experience that a gong was not sufficient for clearing a way for the electric vehicle in crowded streets, the opinion was expressed that a loud electrically-operated horn was the best type of signal.

It was decided to invite Mr. Percy Still, the engineer and manager of the Chelsea Electric Supply Co., to become a member of the Committee.

Fans v. Fire.—The use of electric fans as an adjunct by a fire department in putting out a blaze appears to be novel. In Boston not long ago a fire broke out in the basement of a building occupied by a wholesale paint and chemical concern. The fumes and smoke became so thick that it was impossible for the firemen to enter the basement or direct a jet with any effectiveness, when someone thought of electric fans. Half-a-dozen of the ordinary 16-in. size were requisitioned by the fire chief, and their breeze was directed down the stairway. After the rear basement windows had been broken to allow of the escape of the smoke and fumes, the fans gradually cleared the basement, so that the firemen could work quickly and effectively in extinguishing the flames.